RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.

PUBLISHED EVERY FRIDAY BY THE RAILROAD GAZETTE AT 83 FULTON STREET, NEW YORK
BRANCH OFFICES AT 375 OLD COLONY BUILDING, CHICAGO, AND QUEEN ANNE'S CHAMBERS, WESTMINSTER, LONDON

EDITORIAL ANNOUNCEMENTS.

THE BRITISH AND EASTERN CONTINENTS edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

CONTENTS

EDITORIAL:
- Three Resignations 261
- Causes of Pennsylvania and New York Central Derailments. 261
- State Commissions. 261
- Enginemen's Hours. 262
- Economics of Traffic Agreements. 262
- The Dangers of Speed. 263
- Train Accidents in January. 263
- Refunding Cash to Forgetful Commuters 264
- Delaware, Lackawanna & Western..... 265
- New Publications 266

ILLUSTRATED:
- The New Union Station of the Gould Lines at Little Rock 268
- A New Form of Suspension for Contact Wires 273
- The Timmis Bogie Lead..... 276
- Details of Pacific Locomotive for National Railroad of Mexico. 283

CONTRIBUTIONS:
- Remedies for Car Shortage 266

MISCELLANEOUS:
- Working Regulations for Boston & Maine Enginemen 267
- The New Canadian Sunday Law..... 269
- The Harriman Investigation..... 270
- Operating Features of the Chicago Freight Tunnels. 272
- Derailment of Pennsylvania Special—Report of Committee on the Cause..... 272
- Results Under Electrification in England 276
- Government Report on the Block System.. 277
- Mileage of Railroad Worked by the Block System. 280
- Final Report of the Pennsylvania Railroad Special Investigating Committee. 281
- Simplon Tunnel (Note) 269

GENERAL NEWS SECTION:
- Notes 285
- Trade Catalogues 286
- Obituary 287
- Meetings and Announcements 287
- Elections and Appointments 287
- Locomotive Building 288
- Car Building 288
- Railroad Structures 289
- Railroad Construction 289
- Railroad Corporation News 290

VOL. XLII., No. 9. FRIDAY, MARCH 1, 1907.

The most recent turn in the wheel of Panama Canal administration is the rejection of the bids of private engineering firms to complete the work on a percentage basis, and the expressed determination of the Government that army engineers shall perform this work—which is as it should be. With this news comes the announcement that John F. Stevens has resigned as Chief Engineer of the canal, and that he will be succeeded by Major George W. Goethals, Corps of Engineers, U. S. A. It chances, therefore, that three chief officers of the canal have retired in succession, for private reasons. One, in retiring, was dismissed with warm praise and enthusiastic expressions of esteem; one, with dignified silence; one, with calumny and insult. In viewing these three cases, can the President and the Secretary of War show cause why they should not make public amends to John F. Wallace?

The Pennsylvania Railroad Company has shown its capacity for self-government by a quick and thorough investigation of the cause of the derailment of its 18-hour New York-Chicago express train at Mineral Point, Pa., on February 22. It has also done a public service, without precedent so far as we can recall, in making public the full report (in another column) with its suggestive recommendation. Voluntary action of this sort by all the railroads would make unnecessary the establishment by government of such a train accident investigation bureau as was outlined in these columns last week, but this is too much to hope for. In sharp contrast with this quick, orderly and conclusive examination and report are the investigations of the similar derailment on the New York Central, still dragging along. The Coroner, the District Attorney and the state railroad commissioners are wandering far afield. On the Pennsylvania the curvature was 3¼ degrees and the speed was 50 miles an hour. On the New York Central the curvature was 3 degrees and the speed within 50 miles per hour. The Pennsylvania engineman "made an eight-pound reduction of his air to steady the train" just before entering the curve. The New York Central motorman made a like application of the brakes at a similar point for the same purpose. It was good engine running. The Pennsylvania derailment was caused "by some foreign material which became wedged between the flange of the left rear tender truck wheel and the inside, or low, rail." The peculiar and unusual shearing of the bolts which held the clips to the steel ties on the Pennsylvania was precisely like the shearing of the spikes which held the rails to the wooden ties on the Central. The elevation of the outer rail on the Central 3 degree curve was 4½ in., which counterbalances the centrifugal force due to train movement at the rate of 46 miles an hour, so that it would seem that in this case no account need be taken of the lower center of gravity of the electric locomotive. There was only a small lateral thrust due to the speed. The point where trouble began—at or near the rear wheels of the leading locomotive—is identified. With these known facts it is difficult to imagine an application of force sufficient to shear the spikes and spread the rails, acting in any other way than as a wedge. This is not saying that the forces which tore out the Central's track did so act, but it is a reasonable inference, materially emphasized by the Pennsylvania's findings. But this obvious direction of inquiry is neglected by the several investigators, who are making theoretical studies of centrifugal forces, the resistance of materials and suggestive inquiries of the reason why operating officers are not made members of the board of directors.

The infirmities of the "political" Railroad Commission of Connecticut, which we very recently had occasion to point out, have had quick illustration in other commissions of that state. The Tax Commissioner has just been removed by Governor Woodruff on evidence showing an offer to secure for $1,200 a county commissionership; an appeal has been made to the Governor by the Mayor of the city of New Britain to punish one of the two bank commissioners on the ground that his carelessness let escape a local savings bank officer who had defaulted in some $600,000; and there are reports more credible than mere rumor of charges against other commissioners yet to come. All these are samples of the same vicious system, though not often shown up so suddenly and in such extension in a single state. The bad sequence is continuous and logical. Languid and unassertive citizenship breeds the "political" appointing power; it, in turn, the political commission; and it, in its turn, the

public evil which gathers until it bursts. It is hardly a surprise that we find in Connecticut a bill in the General Assembly, supposed to have emanated from the Governor, calling for the radical reorganization of the Railroad Commission. It is possible, though far from positive, that such a proposition, joined to a similar one in New York state, heralds the beginning of an uplift in the *personnel* of the State Railroad Commissions of the country, some thirty-five in number already, and several states proposing to adopt them. The Connecticut and New York examples serve at least to blazon the evil and outline clearly its remedy.

The *Locomotive Engineers' Journal*, answering a critic, takes occasion to deliver its own views on level-headedness among enginemen and says:

"There is no business to be named wherein intoxicating liquor should be more rigidly excluded than with those in charge of locomotives, transporting hundreds of people and large property values, to say nothing of the additional risk on their own lives. One drink stimulates and when the effect of that stimulant is gone the system is as much below normal as the stimulant raised it above, and nodding instead of the usual alertness is very likely to follow. Engineers should remember that the safety of their own lives depends largely upon the alertness and energy with which they perform their extra hazardous duties, and that there is no time nor place in their work for stimulants. Everyone who has not thought of the dangers such a practice creates should think, and act on the thought. Let stimulants alone! Leave the brain clear, for all its powers are needed when in charge of a locomotive.

"Railroad men everywhere and particularly the members of the Brotherhood of Locomotive Engineers court the most rigid investigation of causes of accidents and if a bottle of spirits is found to contribute to it, the law of the order would be immediately in effect which reads, 'Should any Brother be found guilty of neglecting his duty, or injure the property of his employer or endanger the lives of persons, while under the influence of liquor, it shall be the duty of the presiding officer to declare the offending Brother expelled without a ballot to designate the degree of penalty.' Our insurance department shows how vital is our interest in the matter of safety, with 49,000 members insured, with death and casualty claims amounting to about $150,000 per month, and, having paid a total of $16,500,000 to families of deceased, we are not likely to be indifferent as to cause of accidents; and criticism of engineers, based upon facts, whether drink, carelessness, lack of judgment, or other cause is courted, so we may render all possible assistance in effecting a cure."

The railroad world is not yet beyond the need of lectures on temperance notwithstanding the great improvement that has been made over the conditions of former years, for we still hear, now and then, of neglect of duty and even of collisions which are due to intoxication, and we offer no apology for printing this brief lecture. Our main object, however, is to call attention to a few lines which the writer of this article put in merely as embellishment, but which from another point of view should be emphasized as of prime importance: the exhortation to "leave the brain clear, for all its powers are needed when in charge of a locomotive," and the declaration that the members of the Brotherhood "court the most rigid investigation of causes of accidents." In opposing the proposed Federal law to limit the working hours of enginemen, and the law proposed in Alabama to prohibit the running of unnecessary trains on Sunday, some enginemen have strenuously advocated a law that distinctly favors dull brains—the law of go-as-you-please. To leave a hundred enginemen to decide for themselves when they may safely work excessive hours is to definitely encourage 10 per cent. of them, more or less, to stay on their engines till they fall asleep, or become so drowsy that they are about as dangerous as one asleep, for in these times there will almost surely be an appreciable number of runners so mentally or morally deficient as to introduce this element of danger. With men as scarce as they now are, this caution applies also to trainmasters and engine foremen, for men who do not intelligently care for their own lives and who feel little responsibility for those of fellow employees may turn up any day. In hiring "floaters" to run engines the danger of getting a man who is in some respect unreliable is as great as ever, while the temptation to wink at his weaknesses is increased by the pressing need of getting men of any kind who can handle an engine. In courting investigation of causes of accidents the Brotherhood would, no doubt, add the proviso that the decision to be made as the result of the investigation should be a just one; but enginemen should bear in mind that under present conditions on many roads Justice has a hard time of it. She is, indeed, blindfolded so as not to be prejudiced by what she may see, but her ears hear strange tales. The engineman, whispering in one ear, tells her that he can safely work twenty hours without laying off for rest, while the trainmaster on the other side tries to hypnotize her by pretending to believe that he himself is not responsible for recklessness of that kind on the part of enginemen. A certain shrewd lawyer desired that justice should be done—provided that the result proved favorable to his side—and tried to believe that he was not damaging his reputation. The honest engineman and trainmaster cannot afford to take that position. Real justice often means less wages and fewer freight cars moved; for only on that condition can the lives of fellow employees and of passengers be rightly safeguarded.

THE ECONOMICS OF TRAFFIC AGREEMENTS.

The most prominent authority in the country on railroad finance, if not on railroad management, has been giving his ideas in public this week. Mr. Harriman, in the course of his examination by the Interstate Commerce Commission, frequently took occasion to bring forward his views on various features of railroad management. Asked by Commissioner Lane why the Union Pacific as a railroad should have the power to buy other railroads, he gave his views on the question of railroad consolidation as follows:

I believe, under proper regulation and proper statutes, which would enable railroads to combine and establish lines upon which traffic could be moved at the least cost, we could reduce our rates; but just so long as we are prohibited by law from agreeing among ourselves without the danger of being sent to state prison, you have this chaos that now exists. Just as soon as we can get laws that will enable us to combine and establish these lines so that we can conduct the traffic on the lines of least resistance at the least cost, we will then be able to reduce the charge and also to increase wages or to stand the increase in wages and not before.

Q.—What is the law that you would want to bring about this beneficial result? A.—A law that would enable corporations to make contracts between themselves under proper regulations, just the same as individuals have the right to make contracts; contracts that would be standing and enforceable for a long term of years, so that they would enable railroads to establish these lines upon which traffic could be moved at least cost, taking various parts of the lines as they now exist.

Q.—What competition would there then be between railroad lines? A.—As I said, it should be under proper regulation. I do not think it is to the advantage of the business interests of this country to force business around on improvident up and down hill lines, when there is a straighter and more economic line to be used. I do not mean to say that no business ought to be allowed to go over that line, because there are other conditions sometimes, when the less fortunate line can do business to better advantage and at less cost; that is, in filling out its trains.

But there should be some law—and I think the President of the United States had that in his mind when he sent his message to Congress last December; I do not remember his exact language—that there should be, under some proper control, a change in the laws which would enable contracts to be made between railroads.

This contention strikes at a vital point in the present discussion about railroads. As President Hadley showed some 20 years ago in his "Railroad Transportation," which is still the authority in its field, a railroad represents the most extreme form of fixed capital. Even though it is losing money, it cannot go out of business. There is, in fact, no competition so severe as that of a bankrupt road. Therefore, in the last analysis competition between railroads is impossible. There must be either agreements between the roads as to division of business or combination—this not as a result of the lawless tendencies of railroad managers, but of definite economic forces. This is a fact which seems to be generally lost sight of at present. And it is hardly surprising that it is so when existing railroad laws, both Federal and State, so generally insist on competition. Since the passage of the Sherman Law in 1890, if not since the enactment in 1887 of the original Interstate Commerce Act, the railroads have been face to face with a necessity, based on an ultimate economic fact, which they were forbidden to meet lawfully in either one of the two possible ways. By the act of 1887 competing lines were forbidden to pool their traffic; by the Sherman Law, to combine. The situation has been relieved by the prosperity of the last ten years which has prevented the necessity for cut-throat competition, but nevertheless the results of the double prohibition to the railroads has been the formation of gentlemen's agreements and other similar arrangements just outside the reach of the law. Mr. Harriman's desire is to end this anomalous situation by allowing railroads by one course or the other to meet this obvious economic fact of their existence; the public weal to be safeguarded by giving the Interstate Commerce Commission full regulation as to rates and service. Not only would this serve to put railroad competition on a legal basis, but also it would make possible great economies in operation by apportioning the traffic in the most economical way among the different lines. This suggestion of Mr. Harriman's goes to the heart of the railroad problem. It is a large view of the subject by a large man. For however much we may criticize his financial methods, there is no doubt whatever that as a railroad organizer and executive his ability is exceptional.

THE DANGERS OF SPEED.

In his testimony this week before the New York Railroad Commission, Mr. Newman, President of the New York Central, made two statements: (1) Fast trains are furnished because the public demands them. (2) The limit of safety for fast express trains has not yet been passed. The first of these statements is unquestionable. The experience of the 18-hour trains between Chicago and New York proves that enough people to fill those trains want to travel at that speed and also that this fast traffic is increased traffic, inasmuch as the loading of the other trains has not been materially lessened. The passenger movement by the Empire State Express was, from the beginning in 1891, found to be almost entirely in addition to the then passenger movement on the road. Voluntary competition in speed, for any considerable period, is unusual. It is more apt to take the form of increases in comfort and luxury, as in the admirable trains of six competing lines between Chicago and St. Paul.

The second statement, that the limit of safe speed has not been passed, needs examination. The record of some high-speed scheduled trains seems to corroborate it.

On October 26, 1891, the Empire State Express began running on regular schedule between New York and Buffalo at an average rate of speed, including four stops, of over 52 miles an hour. For 15 years and four months this train has performed this fast service each week day with unusual punctuality. The average speed has been increased to 53.3 miles per hour, which involves a daily running over considerable stretches at more than 70 miles an hour, and the speed is said to have been at times 100 miles an hour. In the past 4,800 week days the two east and west expresses have run 4¼ million miles with no serious accident involving the loss of a passenger's life.

On the Great Western Railway, in England, between London and Bristol, over 118 miles, daily trains each way have been running for many years, covering the distance in two hours, with an average speed, including one rather long stop, of 59.2 miles per hour. No serious accident has occurred.

In looking over the record of high-speed scheduled trains we find fatal accidents, but it is necessary to examine further and find whether or not the speed was a factor in causing those accidents. The two fastest scheduled trains in the world are the Pennsylvania's and the Reading's Camden and Atlantic City trains, the first of which is timed for a speed of 68.1 miles per hour for a distance of 59 miles, and the second a speed of 66.6 miles per hour 55½ miles. These trains have not been immune from fatal accidents, but with one exception there have not been great accidents and that one was not due to fast running—either that fast running due to the schedule or to a violation of orders. The most serious accident occurred on July 30, 1896, when the engineman of the Reading train disregarded his signal at a grade crossing of the Pennsylvania's line. Due to this negligence, and probably not even indirectly due to his speed, his train collided with a slow Pennsylvania Railroad train at that crossing and killed 47 people on the slow train. No passenger on the fast train was killed.

During the Chicago Exposition year, 1893, the Columbian Express made its daily 20-hour trips between New York and Chicago, over the New York Central and the Lake Shore, without serious accident. This cannot be said of the 18-hour trains running for nearly two years on both the New York Central and the Pennsylvania. On June 21, 1905, the New York Central's train ran through an open switch at Mentor and 15 passengers were killed. The speed of the train had nothing to do with the cause of this derailment; it would have occurred at a speed between 30 and 40 miles an hour, although it is undoubtedly true that the destructive effects on the train after the derailment, and probably the number of passengers killed, were greatly increased because of the high speed. These destructive effects increase as the square of the speed.

It should be borne in mind that scheduled high-speed trains have been made as safe as they appear to have been made only by reason of extra care and watchfulness in their running, by the use of cars of strong construction, vestibuled throughout, and also by running them on tracks set apart in most cases for passenger service. It is recognized by all railroad officers that these are the only conditions under which fast service can be maintained safely.

Nevertheless the prevailing opinion that fast running is the cause of many wrecks and losses of life is fully substantiated. For example, a newspaper train on the New York Central was derailed near Little Falls, N. Y., on a 7 deg. curve solely because of excessive speed. Two were killed and one was injured. A passenger train on the Wabash, at St. Louis, was derailed on a 10 deg. curve. As the speed was estimated at 60 miles an hour there can be no question as to the cause. One was killed and 43 were injured. A mail train on the Pennsylvania was derailed on a 7 deg. curve at an estimated speed of 66 miles an hour, and no further investigation of the cause was needed. Two were killed and four injured. It has, however, a sobering effect on any attempt at quick judgment to consider two recent derailments, one on the Louisville & Nashville at a speed of 12 miles an hour where nine people were killed, and another a derailment on a bridge where the speed was 60 miles per hour and none were killed.

The official reports of the Interstate Commerce Commission since June 30, 1906, are not yet available, but an examination of a reasonably correct record during the past three months furnishes some lessons. Of 64 serious accidents in November last, 25 were caused by passenger trains and 39 by those classed as freight trains. There were two high-speed accidents, but neither of them was a high-speed scheduled train. Of the 52 serious accidents reported for December of last year, 28 were caused by passenger trains and 24 by those classed as freight. One of those accidents, which occurred in a fog, was undoubtedly due to the speed being beyond the control of the engineman, but it occurred under the unsafe permissive system of using block signals. In 45 serious accidents in January 123 persons were killed. Twenty-three of these accidents were collisions and caused the loss of 80 lives; one was due to a dynamite explosion which killed 16 persons: another due to a boiler explosion which killed five persons. We do not find indication of any of these accidents being caused by high speed; nevertheless this is not conclusive; the causes have not all been reported.

We arrive then at only a partial conclusion. High-speed running has been made reasonably safe under a certain set of conditions. It is unsafe unless the track and train are strong enough, unless the track is devoted exclusively to passenger service or the way is entirely cleared by special order. There are other absolute requirements: The high speed brake is essential. The distant and home signals must be so placed as to allow the engineman to control and stop his train within the required distance under all weather conditions. Of course, every turnout and drawbridge must be interlocked with the signals. This is not a complete enumeration of the physical conditions necessary for fast running, but any competent railroad officer can complete the list.

The final essential condition—effective discipline and uniform obedience to orders by the trainmen and trackmen—can never be secured. The ideal can be approximated. It is a general prevailing opinion among railroad officers that in this country we are now not approximating the ideal; we are retrograding. A lack of zeal and fidelity among railroad employees seems to be growing. The cause of this is, to some extent, a psychological study. Perhaps it is in part due to the prevailing prosperity, which unsettles the minds of many otherwise contented men; perhaps it is partly due to the open encouragement, by those in high governmental authority, of the trade unions and the increasing development of the most vicious elements in the trade union idea. This study would be interesting, but for the moment it is unprofitable. Whatever may be the cause of the present deterioration in discipline the present duty of railroad officers to get and maintain better discipline is plain.

Train Accidents in January.

Our record of train accidents occurring on the railroads of the United States in January includes 23 collisions, 18 derailments and three fires and explosions, 45 accidents in all. This record is not published in full, as has been done heretofore, except in the cases of the few accidents which are especially prominent—in the present instance four collisions, two derailments and one explosion. The record of "ordinary" accidents—which term includes, for our present purpose, only those which result in fatal injury to a passenger or an employee or which are of special interest to operating officers—will henceforth be given as below, in the shape of one-line items for each accident, showing date, location, class and number of deaths and injuries.

As most of our readers already know, this record is based on accounts published in local daily newspapers, except in the cases of accidents of such magnitude that it seems proper to send a letter of inquiry to the railroad manager. The official accident record published quarterly by the Interstate Commerce Commission is regularly reprinted in the *Railroad Gazette.*

The seven prominent accidents in January are distinguished

from the others in the list by the use of two lines for each of the seven items. Following are condensed accounts of the circumstances of these seven cases.

The collision near Alta Vista, Kansas, on the 2d, resulting in the killing of 31 Mexican laborers and three other persons and the destruction of most of the bodies by fire, has already been reported in the *Railroad Gazette*, pages 26 and 37. Southbound passenger train No. 29 left Volland after an order had been received there for it to wait for northbound train No. 30, the operator failing to deliver the order. No. 29 had been on the side track, and backed out while the meeting order was being received. The operator claims to have set the signal to stop the train, but it did not stop and there seems to be a belief that, expecting the train to stop to take water, he did not set the signal. There is a rule requiring that where a meeting order for a passenger train requires the train to stop at the station where the order is delivered, torpedoes shall be used, but this rule was not complied with in this case. This operator was only 18 years old, though in applying for employment, a few months ago, he gave his age as 23. He had been in the service of the Rock Island but three days.

The circumstances of this case so strongly indicate that the operator's lack of experience or of training or of moral character must be taken as the immediate cause of the collision, that extended comment does not seem to be called for. The need of training, experience and moral character in operators has been set forth in the columns of the *Railroad Gazette* times without number. As was said by a prominent daily paper in commenting on this collision, if competent and trustworthy operators cannot be had at any price it is time to consider whether one can travel by railroad in reasonable safety unless we reduce the speed of all trains. According to the newspapers the block system had just been put in operation on this line; but evidently it was for the protection of trains from rear collisions only—a half-way measure that, we should think, would be very unsatisfactory.

The collision at Bardwell, Ky., on the 11th, occurred about 11 p.m., and resulted in the wreck of a locomotive and 10 cars. The leading train had stopped to set out a defective car and the other train not only approached the station too fast but, it is said, had disregarded a block signal set against it. The wreck was covered with oil from two tanks, but it does not appear that it took fire. The engineman was arrested on a charge of manslaughter.

The train derailed at Barney, N. Mex., early on the morning of the 13th was No. 30, which was one of the two involved in the collision at Alta Vista. At Barney two passengers, two trainmen and an unidentified Mexican were killed. The engine was overturned.

The trains in collision at Fowler, Ind., on the 19th, were passenger train No. 38 from Chicago to Cincinnati and a westbound freight train. There was a dense fog at the time (2.30 a.m.) and the engineman of the passenger train ran past the station and met the freight about 4,000 ft. beyond. The wreck took fire at once and three of the passenger cars were burnt up. All of the persons killed were in the leading passenger car (a combination car), and their bodies were mostly destroyed in the fire. The preponderance of evidence is that the engineman of the passenger train ran past a stop signal, but the engineman denies this and there is nobody to corroborate him. The operator claims he gave a stop signal and is corroborated by the village night policeman, who makes a sworn statement that he personally noticed the position of the signal before the arrival of the train and that it showed red. Five or six passengers were killed or fatally injured, three trainmen were killed and ten passengers were injured. The passenger engineman was about 49 years of age, a man of exemplary habits and character, and considered in all respects one of the very best men on the road—one who is usually careful about signals and about the observance of rules. But the statement of the operator, supported by the statement of the night policeman, that the signal was red, is accepted by the Superintendent.

The accident at Sandford, Ind., at about 9 p.m. on the 19th, was the wreck of westbound local passenger train No. 3 by the explosion of powder in a car in a freight train standing on the side track at Sandford station. The whole passenger train was instantly wrecked, and the wreck began burning at once. The fire destroyed the whole wreck. Fourteen passengers and two employees were killed (and, it is reported, several other persons), and 33 persons were injured. The cause of the explosion is not known, but the theory most favored by the officers of the road is that it was due to lightning. An electrical storm was raging a few miles away.

The train derailed at Delaware, Tex., on the 20th was an express from Fort Worth. It was running at high speed on a curve when the baggage car and two passenger cars jumped the rails and fell down a bank. The injured were all passengers.

In the collision at Deerfield on the Boston & Maine on the 29th a westbound passenger train was unexpectedly stopped about 4 a.m. and was run into at the rear by a following freight, which had followed the passenger from a station six miles back. The collision was a violent one and the reason that the list of fatalities is so small is that the rear car of the passenger train was nearly empty. All of the killed were employees of the road, riding in this car. Four of them were off duty.

Train Accidents in the United States in January, 1907.[1]

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	No. persons reported Killd.	No. persons reported Inj'd.
1.	Louisville & Atlantic.	Evelyn.	Flange.	Pass.	0	8
1.	Rio Grande Western.	Price, Utah.	bc.	P. & Ft.	3	1
2.	Atch., Top. & S. Fe.	Kingfisher.	ms.	Pass.	0	3
2.	Northern Pacific	Hawley.	rc.	Eng.& Ft.	3	4
2.	Northern Pacific	Livingston.	xc.	Eng.& Ft.	2	0
†*2.	Chicago, Rock Island & Pacific.	Alta Vista, Kan.	bc.	Ft. & P.	34	33
2.	Union Pacific	Brule, Neb.	rc.	P. & P.	1	2
3.	Southern Pacific	Comstock, Ore.	bad track.	Pass.	2	0
4.	Lake Erie & Western.	Montmorenci.	derail.	Ft.	2	0
5.	Louisville & Nashville.	Oxmoor.	xc.	Ft.	1	2
†6.	Chic. & North-West'n.	Loveland, Ia.	fire.	Pass.	1	3
6.	Atch., Top. & S. Fe.	Blue Water.	ms.	Pass.	0	3
*6.	New York Central.	Red Creek.	rc.	Fts.	2	3
11.	Great Northern	Petersburg.	rc.	Fts.	2	6
11.	Illinois Central	Bardwell, Ky.	rc.	Fts.	4	0
12.	Buffalo, Roch. & Pitts.	Silver Lake J.	runaway.	Ft.	1	4
†13.	Chicago, Rock Island & Pacific.	Barney, N. M.	ms.	Pass.	5	8
13.	Missouri Pacific	Salina.	rail.	Pass.	1	1
13.	Chicago & Alton.	Bloomington.	xc.	Ft.	2	6
14.	Chicago & W. Ind.	Chicago.	rc.	Pass.	0	7
14.	Atlantic Coast Line	Benson.	bc.	P. & Ft.	0	4
14.	Southern Pacific	Montello.	unx.	Pass.	1	8
14.	Chic., Rk Isld & Pac.	Waldron, Mo.	bc.	P. & Ft.	3	4
14.	Atlantic Coast Line.	Screven.	xc.	Ft.	2	0
16.	Phila. & Reading.	Bridgeport.	boiler.	Ft.	5	0
18.	Atch., Top. & S. Fe.	Sylvia.	bc.	P. & Ft.	1	Many.
18.	Penn., West of Pitts.	Millville.	xc.	Fts.	1	2
18.	N. O. & North Eastn.	Purvis.	bc.	P. & Ft.	1	6
19.	Chic., Ind. & Southn.	Schneider.	bc.	Fts.	2	0
19.	Lake Sh. & Mich. So.	Osborne, Ind.	ms.	Pass.	0	13
†*19.	Cleveland, Cincinnati, Chicago & St. Louis.	Fowler, Ind.	bc.	P. & Ft.	8	10
19.	Pere Marquette	Alma.	washout.	Pass.	1	3
†*19.	Cleveland, Cincinnati, Chicago & St. Louis.	Sandford, Ind.	explosion.	Pass.	16	33
20.	St. Louis & San Francisco.	Delaware, Tex.	loose rail.	Pass.	0	20
21.	Lake Sh. & Mich. So.	Blissfield.	ms.	Pass.	1	12
22.	Illinois Central	Aplington.	brake-bm.	Ft.	1	3
22.	Gulf & S. I.	Lumberton.	acc. obst.	Ft.	1	4
23.	Michigan Central.	Tekonsha.	xc.	Fts.	1	0
23.	Baltimore & Ohio.	Letart.	bad track.	Ft.	3	1
24.	Southern Pacific	Deeth.	rail.	Pass.	1	3
28.	Northern Pacific	Dickinson.	bc.	Pass.	1	3
28.	Seaboard Air Line	Rockmart.	acc. obst.	Ft.	1	0
29.	Mo., Kan. & Texas.	Crowder City.	bc.	P. & Ft.	0	8
29.	Boston & Maine.	Deerfield, Mass.	rc.	Ft. & P.	6	2

*Wreck wholly or partly destroyed by fire.
†Passenger or passengers killed.

It has been announced that on the Long Island Railroad henceforth duplex tickets will be issued to passengers where commutation tickets have been forgotten; and that by presenting the commutation ticket and cash fare ticket at the office of the company the cash fare paid to the conductor will be refunded. This would seem to be a very reasonable concession, provided passengers are reasonable also. It seems unfair—in the language of the typical "commuter," a damnable outrage—to make a passenger pay twice for the same ride, especially if he be one of those who do not cheat the company at every opportunity. But, on the other hand, if refunding is too easy some passengers will forget so often that conductors will be bothered unnecessarily, and we shall lapse back into the condition of thirty years ago, when every regular suburban passenger felt that he had a vested right to "travel on his face," and the chief qualification of the suburban conductor was his ability to remember a thousand faces, so as not to let the go-as-you-please plan of payment get entirely beyond bounds. The Long Island will require pas-

[1]Abbreviations used in Accident List:

rc	Rear collision.
bc	Butting collision.
xc	Other collisions; as at crossings or in yards. Where only one train is mentioned, it is usually a case of a train running into a standing car or cars or a collision due to a train breaking in two on a descending grade.
rail	Derailment due to broken rail.
bridge	Derailment due to failure of bridge.
switch	Derailment due to broken or defective switch.
frog	Derailment due to broken or defective frog.
dr	Other derailments due to defects in roadway.
wheel, axle, truck beam (brake-beam), drawbar	Derailment due to breakage of part named.
eq	Derailment due to other defects of equipment.
derail	Derailment at derailing switch.
ms	Derailment due to misplaced switch.
trackmen	Derailment due to negligence of track repairers.
dn	Derailment due to other kinds of negligence.
cattle	Derailment due to animals on track.
washout, snow, ice, landslide	Derailment due to causes indicated.
acc. obst.	Derailment due to accidental obstruction.
malice	Derailment due to malicious obstruction of track or malicious misplacement of switch.
unf	Derailment due to other unforeseen causes.
boiler	Explosion of boiler of locomotive of moving train.
fire	Cars burned while running.
unx	Unexplained derailment.
Pass.	Passenger train.
Ft.	Freight. Any train or engine not a passenger train.

sengers to go to the general office to get their money back. If, still, they are too numerous the proper remedy will be to move the general passenger agent's office to the fourth floor of a building which has no elevator.

Delaware, Lackawanna & Western.

The report of this rich trunk line coal railroad for the year 1906 is both a record of prosperity and a warning that, given a continuance of present hostility against railroads less favorable results must be expected in future. The position of the company in regard to the provision of the rate law, which makes it unlawful after May 1, 1908, for a common carrier to transport in interstate commerce coal mined or purchased by it, thus separating the transportation of coal from its mining and merchandising, it also made clear. The management has been advised by its legal representatives that the company cannot be required to dispose of its coal properties under guise of regulating interstate commerce, especially as by the terms of its charter it has the undoubted right to mine, purchase, transport and merchandise coal.

The results of the year's operations were satisfactory, in spite of the six months' suspension of anthracite mining in April and May, since all other departments of traffic showed important increases. This is particularly true of the higher grades of freight traffic, and, in fact, of the freight traffic as a whole, for general freight earnings increased 12 per cent. This represents an increase in total tonnage of 16 per cent. The figures for earnings from merchandise traffic are not available, but its tonnage increased 22 per cent., and tonnage of miscellaneous commodities was larger by the same amount. As shown in a recent article on the Lackawanna fast freight service (*Railroad Gazette*, February 15, 1907) the road has, within a few years risen from the seventh road in point of first-class tonnage (including other tonnage reduced to a first-class basis) westbound from New York to be fourth among the trunk lines. The methods there described in handling this remunerative traffic suggest the general development of the merchandise freight department which has been going on along with the general improvement of the whole road during recent years. Passenger earnings, too, showed a satisfactory increase for the year—a little more than 12 per cent., or about the same as total freight earnings.

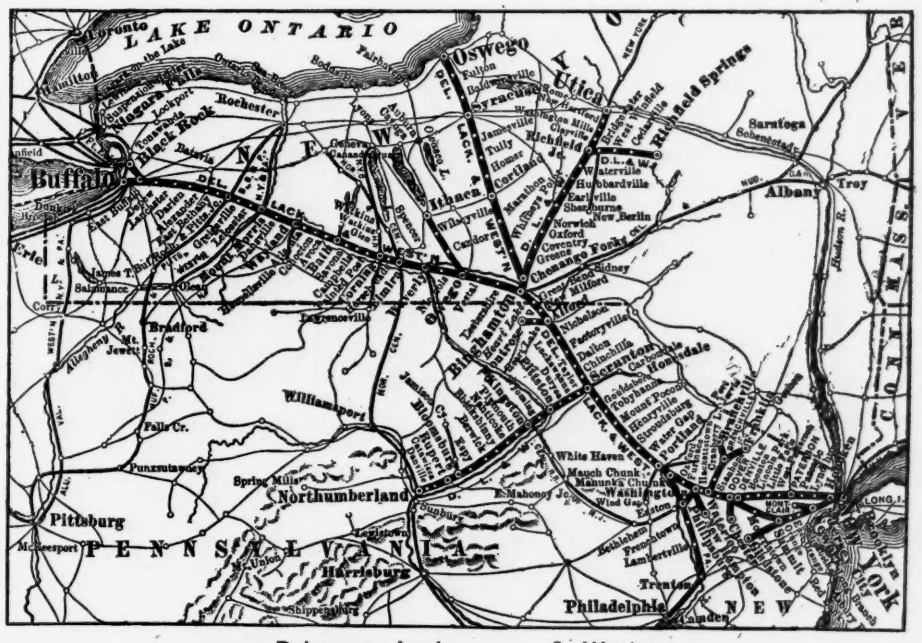
The gain in other than coal freight earnings was almost exactly offset by the loss in earnings from the transportation of coal. The increase in earnings from passengers, mails, express, miscellaneous, ferries and other sources, however, brought up the gross earnings to nearly $33,000,000, an increase of $1,000,000, or 3 per cent., over the figure for 1905. Operating expenses increased slightly more than gross earnings, leaving a decrease of $59,651 in net earnings. Accentuating this decrease in net results was an increase of $572,915 in payments for taxes. This is larger by 57 per cent. than in the previous year, and is particularly referred to by Mr. Truesdale as resulting from new laws following the feeling of hostility and prejudice toward railroads which change the basis of taxing railroad properties. The increase in taxes came notably in New Jersey, where the taxes levied for 1906 amount to over 9 per cent. of the gross earnings and over 30 per cent. of the net earnings of the company on all its business of any kind, through or local, in that state.

The loss in net earnings and the increase in taxes, amounting together to $632,565, were nearly covered by increases in miscellaneous income from investments, etc., and in coal department earnings, which, in spite of the loss of time, increased nearly 10 per cent. for the year. First charges were, approximately, the same as in the preceding year, but nearly $2,000,000 more was charged against income for renewals and betterments, a total for the year of over $5,500,000 on this account. It is for this reason largely that the surplus for the year was only $587,000, against $2,111,000 in 1905. In other words, net income was about the same as in 1905, but more of it was applied to the general betterment of the property.

The large increase in operating expenses is attributed to the scarcity of labor and consequent increased wages necessary, together with the high price paid for all supplies and materials. The amount charged to maintenance of way under regular operating expenses was at the rate of $5,160 a mile, against $4,849 a mile in 1905. Of this, ordinary expenditures cost $3,003, and extraordinary expenditures, which are listed separately in detail, $2,157 last year. The 1905 figures were $2,629 for ordinary and $2,220 for extra ordinary expenses. These figures are, of course, exceptionally large and indicate the high standard which is being carried out. Repairs cost $1,461 per locomotive, against $1,533 in 1905; $472 per passenger car, against $539 in 1905, and $46 per freight car, against $48 in 1905. These figures, it is clear, cover repairs and nothing else. They seem low at first when contrasted with the amount spent per unit of equipment for repairs and renewals by other roads, but not when it is learned that 50 new locomotives, 50 passenger train cars, 52 ballast cars and 4,323 freight cars were bought and paid for in full out of income during the year at a net cost of $4,433,733. This amount came out of renewals and betterments charged against net income, which also covered $496,475 for new shop plants.

The important general improvement policy of recent years has been actively carried on. Yards have been extended at Secaucus, Newark, Scranton, Taylor, Elmira and Buffalo, the automatic block signal system completed over the whole line between Hoboken and Buffalo and a third track built from Scranton east to Nay Aug (*Railroad Gazette*, March 16, 1906) at a cost of $162,000. This third track is to be extended from its present eastern terminus at Moscow to the top of the eastbound mountain grade. This will improve operating conditions by providing a slow track for freight trains all the way up the grade. The ferry terminal at 22d street, New York, destroyed by fire in December, 1905, has been rebuilt and the new passenger terminal at Hoboken was last week put in use. Work has been begun on a new double-track tunnel through Bergen Hill, just west of Hoboken. Plans have been made for a new passenger station and office building at Scranton and a large new locomotive repair plant at that place, the latter to cost about $2,000,000, and to be finished about the middle of 1909. In regard to facilities for repairing equipment, the report speaks as follows:

"The management is entirely convinced that nothing is more vital to the successful operation of a large railroad property than provision of ample repair shop facilities, equipped with the most modern tools and labor-saving appliances for keeping in good repair locomotives and other equipment required for efficient and economical operation."



This belief surely is borne out by the difficulties which other roads have been meeting, due directly to unsatisfactory condition of their motive power.

The following are quotations from the report dealing with the present problems of railroad operation and management:

"The increase in loss and damage account is significant as indicating the extended responsibility imposed on the railroads each year by the laws of Congress and of the different states, also by courts and juries in administering the laws. This is not only true as respects the duties of the railroads to their patrons traveling or shipping over their lines, but as well in cases of accident or damage at crossings or stations or due to an infinite variety of occurrences with which those charged with the operation of railroads are familiar.

"The operating cost of this and all other railroads will increase largely during the coming year, as further general and substantial increases in salaries and wages were made in the latter part of 1906, some of which did not become effective until the first part of the new year. It is with no feeling of resentfulness or pessimism that many officials charged with the responsibility of managing the railroad properties of the country express serious doubts and misgivings over the future outcome as respects the net results of the operation of these properties. They realize from daily experience that the large increase in wages paid will not be in any measure compensated for by increased efficiency of service. On the contrary, they are impressed with the belief that a spirit of independence and

unrest has been engendered and broadly disseminated through one agency or another among the rank and file in all branches of railroad service, the effect of which has been, and may continue to be, to lower the general standard of efficiency of railroad employees. Even though this may not be the effect on most of the old, loyal, well-tried railroad men who have spent many years of their lives in the service, the fact is that many of these men are being retired from service each year; that the demand for shorter hours of service, which is being conceded, requires a larger number of men to perform the same service, and that the great and steady growth of the railroad business each year makes it necessary to employ more new men from year to year. Thus the problem of securing a sufficient number of new men of tried ability and experience to competently conduct the transportation service is a serious and difficult one, and this at a time when the demands and requirements of the service were never so great or exacting. That serious doubt is felt as to the efficiency of railroad service being maintained as hitherto, notwithstanding the higher wages paid, is not to be wondered at, in view of these conditions and outlook.

"The most serious aspect of the present situation as seen from the railroad standpoint is the universal and pronounced feeling of hostility which exists toward the railroads and those controlling and managing them, and the alleged attitude of indifference or unconcern of the latter as to the character, efficiency and safety of the service rendered by the railroads to the traveling and shipping public. No doubt there is some justification for this feeling. On the other hand, there is little doubt that the conditions complained of are not as bad or as universal as claimed, but that they have been exaggerated and distorted very considerably, resulting in much unreasonable prejudice being aroused and bitterness engendered, which are likely to work great wrong and injustice to the railroad interests of the country, and in so doing injure its general business interests without securing proper and adequate remedy of conditions and practices which no doubt do exist and which need prompt and intelligent action to correct. Legislation by Congress and by many of the states is being actively pressed as a universal panacea for all the delays, troubles, losses or embarrassments which can by any possibility be laid at the door of the railroads which undertake to regulate and prescribe the details of their management or seeks to place in the hands of Government officials wholly without knowledge or experience in railroad operations, a supervision and control over them, which, if made effective and enforced, would hamper and embarrass the transportation interests of the country beyond measure."

It is evident that here Mr. Truesdale speaks for the railroads of the country as a whole and sums up the unfavorable conditions which to-day face railroad officers.

The principal operating statistics for the year ended December 31, 1906, are as follows:

	1906.	1905.
Mileage worked	957	957
Coal freight earnings	$12,902,851	$13,993,585
Other freight earnings	10,342,423	9,230,787
Passenger earnings	6,216,224	5,529,002
Gross earnings	32,962,880	31,951,064
Maint. way and structures	4,937,771	4,640,208
Maint. of equipment	2,909,335	2,871,911
Conducting transportation	10,503,943	9,816,196
Operating expenses	18,899,442	17,827,975
Net earnings	14,063,438	14,123,089
Coal department earnings	3,655,119	3,295,426
Total income	16,989,813	17,061,966
Net income	11,378,690	11,525,915
Renewals and betterments	5,551,619	3,587,486
Surplus	587,072	2,698,429

NEW PUBLICATIONS.

The Peabody Atlas of Coal Mines and Coal Railroads in the central commercial district of the United States, accompanied by chemical, geological, and engineering data. By. A. Bement. Published by the Peabody Coal Company, Chicago. 16x18; 149 pages; 42 illustrations; 27 maps. Cloth, $5.

In 1902 the publishers of this atlas issued a large wall map of the coal fields of Illinois and Indiana with the shipping mines indicated thereon. It was accompanied by a bound volume with tabulated lists of these mines. Up to that time there was no publication giving adequate information of this character about the mines of these two states. A revised edition was issued the following year. The present volume has a much greater scope, Ohio, Michigan, western Kentucky, Iowa and Missouri being included; instead of a wall map, sectional maps, page size, are bound into the volume; also a double-page map of the United States, showing its coal areas, and a double-page map of the territory covered in detail by the atlas. Various technical information concerning coal is given, including a brief description of the geology of each coal field, detailed treatment concerning the various coal seams, with their names and numbers, relative importance, localities where the working of them is most active, and chemical analyses showing relative composition of coals from the different states. Methods of manipulation and management of fires are presented, and the determination of conditions of combustion by analysis of the chimney gases is given in such a form as to enable the engineman or fireman to use this means of securing economical combustion, the essential instruments needed being illustrated and described. Several types of the best forms of smokeless boiler furnaces are illustrated and discussed by the author. The volume is one of considerable value to railroad officers, coal producers and consumers. Former issues of the publication were for complimentary distribution. In view of the cost of the production of this atlas, however, and the fact that otherwise it would not be listed or carried in stock by book dealers, a price has been put on the volume.

Official Industrial Guide and Shippers' Directory. Issued by the General Freight Department of the Chesapeake & Ohio. Paper; 8x11; 460 pages. Illustrated.

This publication has just been issued by the general freight department of the Chesapeake & Ohio for the use of the company's patrons and others seeking facts about its territory and resources. This covers the mining, agricultural, manufacturing, commercial, financial and educational advantages of the territory. The first part of the book has many illustrations showing scenery along the lines, views of different industries, particularly coal and coke workings, and also of various agricultural products of the territory. Then follow descriptions of various towns along the line of the road with many photographs. The illustrations are, many of them, poor, but as a whole give a good idea of the regions served by the road. The information is detailed and complete. The book represents a large amount of condensed information, the result of a great deal of work in its preparation.

CONTRIBUTIONS

Remedies for Car Shortage.

Pittsburg, Feb. 18, 1907.

To the Editor of the Railroad Gazette:

Viewing the car shortage question from a number of standpoints, the remedy for it would not come altogether from an increase in what are called terminal facilities, unless these facilities were made most extensive. If the Pennsylvania Railroad, for instance, should provide a storage bin at its Greenwich pier to hold 10,000 cars of coal, it would only be a few weeks until these cars would again be reloaded, and be used as storehouses, and the mines just as short of cars as they may be now. This, of course, is an extreme illustration, but it embodies a principle that applies generally, not only to coal, but to ore, grain, hay and other commodities shipped in bulk.

There is no doubt that at certain points, and for certain commodities, enlarged facilities are needed to take care of current commercial wants. One of the most effective means of lessening the car shortage, with or without the increased terminal facilities, is the regulation and control of the loading of traffic for a given destination. This regulation should take place before the cars are exhausted and the yards and side tracks blocked. It is recognized that no officer of ordinary authority could be expected to discharge this function in an efficient manner; hence the suggestion that an officer, ranking next to the President—say the Senior Vice-President—should be held responsible for the regulation of traffic and also for the movement of cars. His efficiency would be still more pronounced and far-reaching if he were a member of the Board of Directors.

While he would increase the movement of cars and the volume of tonnage, he would also, through his acts as traffic regulator, lessen the expenses of the operating department. Being responsible for the tonnage moved by the equipment, which means revenue to the company, he would naturally have an active interest in providing facilities of all kinds that would expedite the movement of cars on the road and the handling of freight at terminals. Therefore, he should also be the main factor, after the President, in determining when and where facilities should be provided. A Vice-President on a large railroad, with the responsibilities named above, would have duties extensive and urgent enough to require his exclusive time, and the other executives could handle the rest of the business, as is now being done.

Another change that would help the movement of cars is "decentralization." For years the authority of the division officers has been gradually taken from them and centralized at headquarters. The effect has been most pernicious, not only as to the development and economical handling of the tonnage, but also as to the development of men for higher places in the service.

The Division Superintendent's powers should be enlarged, and he should have final authority on improvements involving moderate expenditures.

Another administrative defect is the rebilling of freight at transfer or junction points. This should have long since been abolished. There is no reason why a car of bulk freight should not go from point of origination to its final destination on one bill, and the bill, which accompanies the car, carry on its face sufficient information to enable the agent at destination to make prompt delivery.

When the delays in waiting for bills at junction and transfer points, and at destination, are wiped out, a great many cars will be put into active service. D. F. MARONEY.

Working Regulations for Boston & Maine Enginemen.

In connection with the recent increase of pay of enginemen on the Boston & Maine a new code of rules was adopted governing the conditions under which these men are to work. As this code represents a good example of such a document, revised in the light of recent experience, we reprint it in full, with the exception of the first six sections, which have to do with the rates of wages. These rates are classified for: (1) Consolidation engines; (2) engines of other types not in passenger service; (3) switching engines; (4) all other classes. The day's run is 100 miles or less, except on local freights, where it is 75 miles or less.

7. Whenever engines of different classes are used during parts of day's work the higher rate will be allowed for day's work.

8. In case of emergency, and a regular engineer is called upon to do extra work, between his regular laid-out day's trips, or before registering off duty, he will be allowed 10 miles for less than 10 miles, or less than one hour; 50 miles for 10 miles or over up to 50 miles, or one hour or over up to five hours; all over 50 miles or five hours he will be paid as per articles in schedule covering classification of pay. It is understood this will cover emergency work en route, the time consumed to be deducted from the overtime made outside of scheduled or assigned run. A regular engineer called after registering off or during his lay-off to do extra work will be allowed one day for 100 miles or less, or 11 hours or less as per class of engine employed on.

Regular engineers will not be called upon to do extra or emergency work when extra men are available.

9. The mileage of freight trains each way between Springfield and White River Junction and round trips, Northampton and Oakdale, Woodsville and Berlin, Newport and Woodsville, Lyndonville and White River Junction, shall be 150 miles, first hour's overtime to begin 15 hours and 31 minutes after commencement of day's work.

10. In computing overtime it is understood that 30 minutes or less will not be counted, 31 to 60 minutes to be reckoned one hour, and so on for each additional hour. Overtime to be allowed when the hours exceed the miles, figuring 10 miles to equal one hour.

11. A day's work for engineers will begin at time of registering on duty 30 minutes prior to the ordered or scheduled departure from engine house, and shall end when registering off duty immediately after engine is delivered back in engine house, or into care of some person appointed to take charge of same at end of trip.

12. Callers will be provided for all extra men, also all regular men going on duty between 11 p.m. and 7 a.m., if requested. Spare engineers will be required to live within one mile of engine house, and no regular men will be called beyond that distance. Extra men on call will stand first in first out, if qualified. Callers will be furnished with a book showing names of engineers, when and for what trains wanted, and engineers will be required to sign same when called.

13. Hostlers will be provided at Boston, Fitchburg, East Deerfield, Troy, Mechanicville, Rotterdam, Bellows Falls, Worcester, Nashua, Rochester, Springfield, Northampton, Portland, Manchester, Concord, West Lebanon, Woodsville, Lyndonville, Newport, Sherbrooke, Plymouth, Greenfield, Ayer, Lowell, Salem, Portsmouth and Lawrence.

Hoisting of engines shall consist of receiving them on a designated track near engine house, cleaning fires, sparking, taking fuel, water, sand, filling signal lamps, headlights and cleaning reflectors. This will not relieve engineers from properly inspecting, so far as they can see without going under engine, and reporting all necessary work in book provided at engine houses for this purpose. At Boston Terminal engineers in local passenger service making less than 100 miles per day will take their fuel between trips when fuel shed is located between train terminal and ash pit.

14. Engineers charged with a misdemeanor shall have their case investigated promptly and if found innocent will be paid for time lost; if guilty, they will be informed promptly of the decision arrived at. A representative of the Motive Power Department will be present at all investigations in which engineers are concerned. In case of discipline, right of appeal will be granted if exercised within 30 days.

15. Vacancies will be filled in order of seniority, everything else being equal, within 30 days, the same to be advertised within 10 days for 10 days on the bulletin boards of the division and to be assigned within 10 days thereafter. In case a train is advertised and not bid in, it shall be readvertised every 30 days and recovered from the board, it being considered a vacant run until it is bid in.

All new trains will be first advertised as temporary and remain as such until it is evident they are to be permanent or until the change of time-table. After an extra train has run continuously for 60 days it will be advertised.

16. Switchers will not be advertised. All vacant switchers will be filled by the oldest engineer making application for the same. Vacant permanent switchers will be assigned to the oldest man applying within 30 days from date of vacancy. New switchers will be assigned to the oldest man applying within 60 days from date of vacancy. After the expiration of above limit of time, the first man applying will be assigned. If a road man becomes disqualified, he will be allowed to take any job held by a younger man in switching service. Men who are superseded on account of men becoming disqualified or their switcher taken off will be given seniority rights in switching service. It is understood that a disqualified man will be given the youngest qualified man's job, provided he can get no other through seniority.

17. When engineers have been on duty 16 consecutive hours, they shall not be called on again for service until they have been off duty 10 hours, except in cases of emergency.

18. Engineers attending courts, inquests, etc., by order of the company will not be subject to any loss of time or compensation. If on lay-off day, they will receive regular rate of pay; will, if at home terminal, receive one-half day for five hours or less; over five hours, one day.

19. Extra engineers called for duty and reporting at engine house will be allowed three hours' time if train is canceled and will stand first out; three hours' time will be allowed all regular men whose train is canceled after reporting at engine house. When engineers cross the table with engine, one road day's pay will be allowed.

20. Engineers failing to complete a day's work on account of sickness or any other cause of their own will receive only proportionate pay.

21. Engineers will not be expected to do any repairs, pack boxes or inspect nettings and ash pans on engines putting up at points where repair men are employed.

22. When a train is pulled off (exclusive of temporary trains) the men affected shall have their choice of trains, if exercised within 10 days, according to their age in the service as engineers, everything else being equal. Men who are superseded by those whose train has been pulled off will be entitled to the same privileges. When temporary trains are continued as permanent runs, they shall be readvertised. When temporary runs are mixed in with permanent runs and the temporary runs are taken off, the permanent runs will revert back to the original engineer.

23. When the initial point of a train is changed, a round-trip run changed so that the run does not return to its initial point every day, or part of a run taken away, the man holding the same shall have the first right to it, but if given up it shall be advertised. The man giving up the run shall have his choice in trains, if exercised within 10 days, according to his age in the service as engineer. The words "or part of a run taken away" will not apply unless his earnings are decreased 20 miles or more, his length of day increased two hours or more, or, if in passenger service, a part of his run changed to freight. That clause will apply when a day run is made a night run, although the length of day may not be increased two hours or more. Where special arrangements are made on runs covering change of time-table, that part is not effective.

24. Switch engines running regular trains will receive road pay for same. Switch engines having to go outside of yard limits will be allowed a road day's pay, 10-hour day to apply.

25. Engineers will not be required to work in the engine house. When called for emergency duty they will be allowed 10 miles per hour at standard rate of pay; 100 miles or less, one day.

26. Engineers called and making short mileage will, if requested, remain at engine house subject to further mileage to finish the day or 100 miles.

27. Engineers called for emergency duty and sent out on the road will be allowed actual miles made, house and road miles inclusive; 100 miles or less, one day.

28. Engineers on emergency duty five hours or more will only be used on short mileage to finish the day, except in case of necessity.

29. Engineers called for emergency duty and sent out on a regular man's job will be allowed the man's pay and house time, inclusive.

30. Engineers who voluntarily leave the service and are subsequently re-employed will rank as new men.

31. Engineers transferred permanently from one division to another at their own request shall be listed as new men. If transferred by the proper officials on account of transfer of traffic, etc., they shall retain seniority rights.

32. In case of a surplus of extra men so that they are not getting reasonable weekly wages, the force shall be reduced in the reverse order of seniority.

33. Engineers doubling hills or going after water or coal on account of conditions beyond their control will be allowed mileage in addition to trip.

34. Engineers will be allowed half mileage for deadheading over the road on company's business.

35. The Superintendent of Motive Power will furnish the committee annually a seniority list of engineers on each division.

36. Through freights will not be required to do any switching at terminals or at any other points where switchers are employed, except the regular setting out or taking in of cars.

37. All road mileage will be based on actual distance as given in official time-table. When this distance terminates in a fraction, five-tenths of a mile or less will not be counted; fractions over five-tenths will be reckoned one mile. Shifting miles in road service will not be considered in computing pay of engineers. All mileage made between Fitchburg and East Fitchburg, Worcester Union Station and engine house, and Northampton Passenger Station and No. Tower Yard will be allowed.

38. All trains loading and unloading freight or doing switching shall be classed as locals. This will not apply to trains making less than six stops to take on or set off cars, requiring less than 11 switches at the five or less stops, exclusive of the necessary switching on account of placing air-brake cars for use to handle train, or, when necessary, freight may be unloaded at not more than three of the stops.

Trains consuming more than 30 minutes icing beef shall be classed as locals.

The present practice of handling caboose cars will continue and not be considered switching.

A switch is defined as follows: The setting off of cars from two places in train or taking on a car or cars not ahead on one track.

39. In case an engineer is off sick for six months and no immediate prospect of his return to work, his train shall be advertised as a permanent run; should he be able to resume work he shall take his train, but in the event of his train being discontinued in his absence, he shall retain his seniority rights. The man superseded will be covered by Article 22.

40. Seniority will cover all spare men on their respective divisions. When the spare list is reduced at any point, the men affected will have the right (if exercised within 10 days) to spare work at any point where there are younger spare men. When the spare list is increased at any point, spare men at any other point will have the right to spare work at that point (if exercised within 30 days).

41. Engineers may be granted leave of absence for a period of six months, provided proper notice of the same is given, and this can be done without impairing the interests of the company, and his run shall be advertised as a temporary run. If at the expiration of six months he does not report for duty, his run shall be readvertised as a permanent run.

42. Switch engineers will be allowed one hour for meals between the hours of 11.30 and 1.30 day or night, or not earlier than 4½ hours, or later than 6½ hours, after commencing work. If required to work during the time specified, 30 minutes will be allowed for meals with one hour additional pay.

43. Engineers bidding off trains running over any part of the division which they are unfamiliar with will learn these parts at their own expense.

Engineers whose trains are changed or extended on to parts of the road which they are unfamiliar with will have pilot furnished or time allowed to learn the road at company's expense.

When a division or part of a division is merged into another division or trains are put on to run over two or more divisions of the road, a pilot will be furnished or time allowed to learn the road at company's expense.

Spare men, so as not to lose their turn, will have pilot furnished or time allowed at company's expense to learn parts of the division which they were not required to learn before promotion or which may have been merged since their promotion.

44. Seniority of engineers will date from the day they are regularly assigned to the service as an engineer in accordance with the seniority rule of promotion, it being understood that if through no fault of his own he is not assigned when due, he will be given the seniority date of the first younger man assigned and the older man will be assigned as soon as possible. When two or more men are assigned the same day, their names will be placed on the roster according to their length of service on locomotives of this company. When two or more men enter service the same day and are assigned the same day, their names will go on the roster alphabetically.

45. Engineers on trains receiving a day's pay in one direction who are required to take rest, thereby losing their opposite trip, will be allowed to deadhead at the company's expense to the opposite terminal so as to be ready to take their train next trip.

46. Freight crews receiving a day's pay in one direction, if held at other than home terminal, will be paid at through freight rates after 12 hours. This will not apply to men whose runs are scheduled for a layover of more than 12 hours.

47. When trains are run over two or more divisions, the trains will be awarded so that the mileage made by all the interdivision trains will be equalized as near as possible.

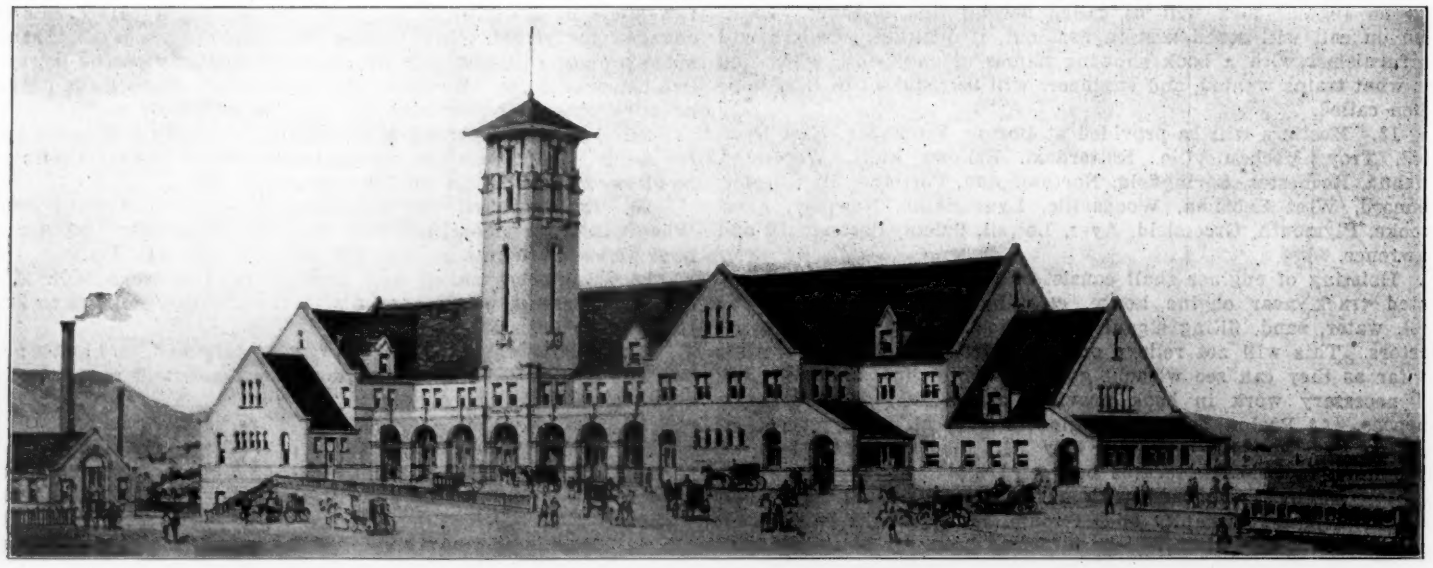
48. When time made by engineers is not allowed as per time slip, it shall be returned to them for correction.

On the New York, New Haven & Hartford all men in engine or train service are required, in every case where they have been on duty 16 hours, to lie off at least eight hours for rest; but they are not to be taken out of service until arrival at a terminal. This rule has been in force about a year and a half, and is now satisfactory both to the men and to the company, although some of the men at first made objections.

On the New York Central an order has been promulgated that engineers, conductors and trainmen after completing a trip taking more than 12 hours and less than 16 hours, must take not less than eight hours off duty for rest. When they are on duty more than 16 hours up to 18 hours, they must take 10 hours off duty for rest. Engine house foremen and yardmasters are required to see that this rule is carried out and report to superintendent any violation thereof. On arrival at terminals, all engineers, conductors and trainmen are required to report the number of hours they have been on duty.

The New Union Station of the Gould Lines at Little Rock.

The St. Louis, Iron Mountain & Southern is building at Little Rock, Ark., a new passenger station to replace the old wooden structure which had so long done duty at that place. It will be a union station for joint use with the St. Louis Southwestern, as heretofore. Besides the main line of the Iron Mountain, branch lines to Ft. Smith, Ark., and to Alexandria, La., center at Little Rock. It is also the headquarters for the Southern District of the operating department. For the following brief description and accompanying plans we are indebted to Mr. E. F. Mitchell, Engineer of Construction of the Missouri Pacific system.



Elevation; Little Rock Union Station.

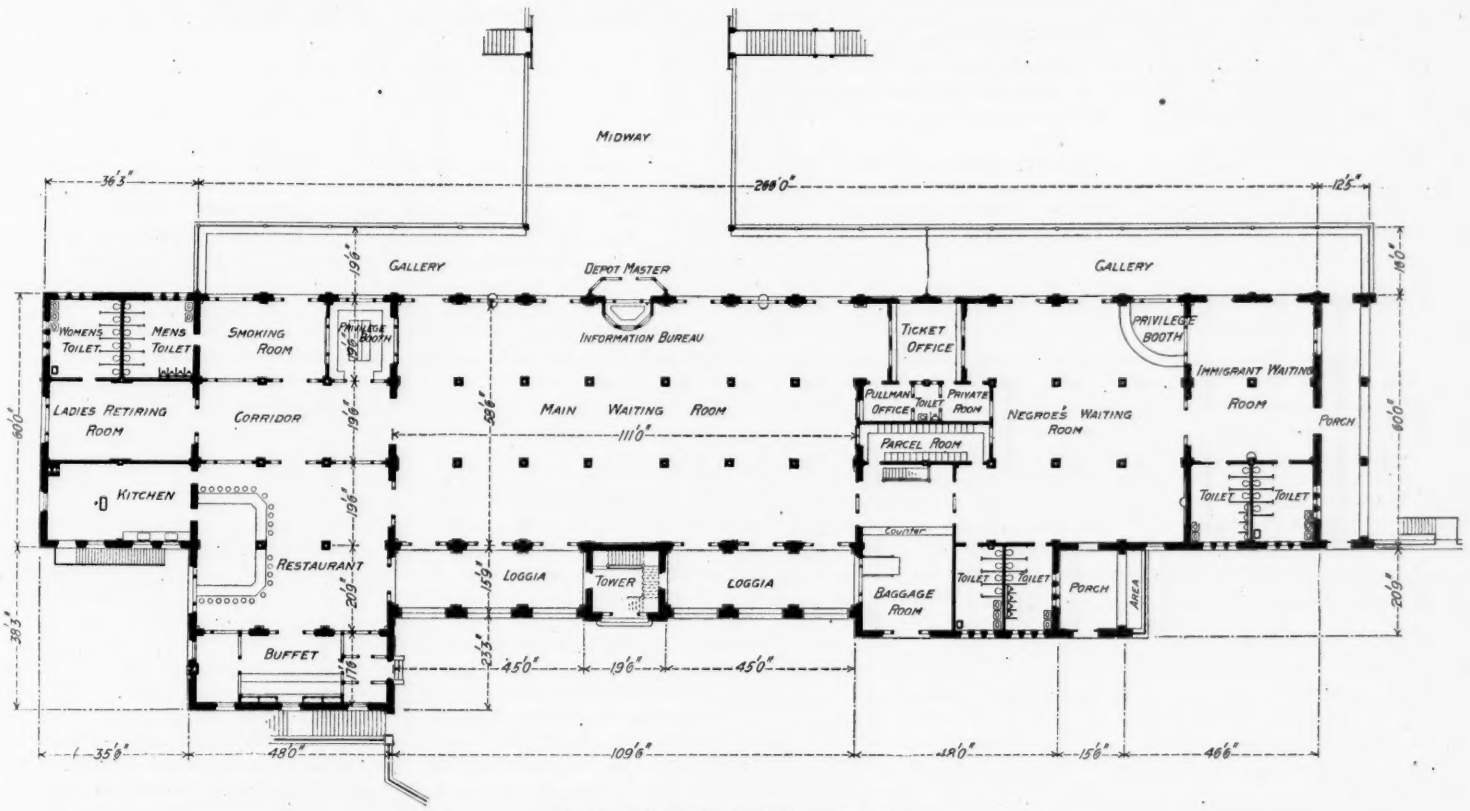
The building, which is two stories high, with a basement and attic, and a tower 120 ft. high, will have its main front toward the city. The building will be 315 ft. long by 60 ft. wide at the ends and 78 ft. wide through the central portion, and will have an ell at the west end 48 ft. wide and 23 ft. long. It will be built of gray pressed brick with Batesville stone trimmings and the roof will be of red tile.

The surroundings and topographical conditions were favorable to an elevated station and that type was chosen. The floor of the

basement is at the track level and the floor of the main waiting rooms is approximately at the level of the main streets approaching them, which merge into a plaza on the southerly side of the building opposite the tracks. From the main floor level a covered "midway" bridge extends over the passenger tracks and platforms, which are reached by easy stairs. Four passenger platforms, covered with umbrella sheds, will be built, each 1,200 ft. long, extending 600 ft. each way from the center of the "midway."

The basement floor, which is at the track level, will be occupied by the baggage rooms, express rooms, commissary, store rooms and kitchen. The main baggage room at the west end of the building is reached by a street approaching from the south at a lower level than the main traveled streets leading to the passenger entrance of the building. The express room at the east end is reached by an inclined driveway from the main streets.

In the central part of the first or main floor is the main waiting room, 110 ft. x 57 ft. It is entered from the plaza through a loggia



Plan; Little Rock Union Station.

14 ft. deep, extending its full length. This room will have marble tile floor, marble wainscot, plastered walls, and the exposed woodwork will be oak. At the west end of this floor is a ladies' retiring room and toilet room, and a smoking room and toilet room for men; also the restaurant and kitchen. On the east of the main waiting room are the railroad and Pullman ticket offices, parcel check room and receiving room for baggage, the latter having a chute to the main baggage room in the basement. Beyond these, in the east end of the building, is the waiting room for negroes, 45 ft. x 57 ft., and for emigrants, 32 ft. x 57 ft., each having toilet rooms. Along the northerly side of the main floor is a gallery 16 ft. wide, connecting with the "midway," on which center the station master's office and the bureau of information.

The second floor of the building will contain the offices of the general superintendent, division superintendent and the operating department organization. A portion of the attic will be finished and used for record rooms.

The foundation of the building has been completed and work is under way on the superstructure and on the retaining walls. Theodore C. Link, St. Louis, is the architect, and the contractor for the superstructure is the Murch Brothers Construction Company, of St. Louis. The foundations were built by Westinghouse, Church, Kerr & Co., New York.

An engineer of the firm which furnishes electric locomotives for the Simplon tunnel says that at a speed of 50 miles an hour in the tunnel the air resistance absorbs 400 h.p., or 40 per cent. of the capacity of the locomotive, against 95 h.p. in the open air. There has been a great falling off of passenger traffic through the tunnel since the Milan Exposition, but such an increase in freight that the number of freight trains has been increased from two to four.

The New Canadian Sunday Law.

The act respecting the Lord's day, which was passed by the Canadian Parliament last summer, and which goes into effect on March 1, is, in some respects, quite stringent, and in forbidding all persons to carry on any business on Sunday (with certain exceptions) appears to make unlawful the running of freight trains for 24 hours, 12 to 12; but the exceptions are numerous. Any person may do any "work of necessity or mercy," and some of the things included in this term are named. Among the things which these exceptions permit to be done are: transmitting telegraph and telephone messages; maintaining fires in furnaces where a stoppage would produce serious injury; necessary work in supplying electric current, light, heat, cold air, water and gas; the conveying of travelers; the continuance to their destination of trains and travelers in transit when the Lord's day begins; loading and unloading merchandise on or from passenger boats or passenger trains; emergency work on railroad tracks and clearing them of snow or ice; yard switching before 6 a.m. and after 8 p.m.; loading or unloading ocean going vessels to prevent serious delay; loading or unloading grain, coal or ore vessels before 7 a.m. and after 8 p.m. after the 15th of September; the conveying of mails; the operating of interprovincial or international street cars for passengers on any line now regularly operated; any work which the railway commissioners may deem necessary to permit in connection with railroad freight traffic. This last clause in full reads: "Any work which the Board of Railway Commissioners for Canada, having regard to the object of this Act and with the object of preventing undue delay, deem necessary to permit in connection with the freight traffic of any railway. The costs of all applications to the Board under this paragraph shall be borne by the applicant, and, if more than one, in such proportions as the Board determines. Notice of application, in which the reasons to be relied on shall be fully set out, shall be given to the Department of Railways and Canals. In all other respects the procedure under *The Railway Act*, 1903, shall, so far as applicable, apply." Except in emergency, employees doing work on Sunday in the telegraph or telephone business or in any industrial process, or in connection with transportation, must be allowed 24 consecutive hours off within the next six days; except that men working in industrial processes not over eight hours a day shall not be subject to this section. Section 5, forbidding games and performances where an admission fee is charged, has a clause including in these any free performance where a fare—as a street car fare—for riding to the performance, includes a charge—direct or indirect—for seeing the performance. The fine for violation of the Sunday law is to be from $1 to $40, and an employer who authorizes or directs unlawful acts may be fined from $20 to $100; corporations are liable to still larger fines. Prosecutions for violation of the law must be begun within 60 days after the offense.

The Harriman Investigation.

The following are extracts from the testimony of E. H. Harriman, President of the Union Pacific, before the Interstate Commerce Commission in New York on February 25 and 26:

THE UNION PACIFIC'S INVESTMENTS.

Mr. Kellogg (the Government's attorney): Now, you have not been buying securities, you say, for speculation? A. That is right.

Q. Then do I understand that the stock of the Illinois Central, of the Baltimore & Ohio, of the Chicago & Alton, of the New York Central, and the North-Western and the St. Paul are for permanent investment or control? A. They are certainly not for control.

Q. Are they for permanent investment or for sale again? A. They are for income from the proceeds, reinvestment of the proceeds of the Great Northern and Northern Pacific.

THE CHICAGO & ALTON.

Q. The Alton was bonded at that time, at the time you bought it, for about $8,500,000, was it not? A. Something like that; eight and a half or nine millions.

Q. Yes; somewhere about eight and a half or nine millions. You immediately placed a mortgage of $40,000,000 upon the property, did you not? A. Yes, and sold $32,000,000 out of it.

Q. You sold those $32,000,000 of bonds to the stockholders for $650 a bond, did you not? or sixty-five cents on the dollar? A. That is right.

Q. And this syndicate [including Mr. Harriman, Mortimer H. Schiff, George J. Gould and James Stillman] got substantially all of the bonds, all but about $436,000? A. Was it that syndicate? I think there was a subsequent syndicate formed, composed of 100 different individuals.

Q. No; I think the bonds were divided among that syndicate. A. That is, they were divided with the stockholders, whoever they were.

Q. Ten million of the bonds were sold for 96? A. I think they were.

Q. And thereby the stockholders, you gentlemen, reaped a profit of over 300 a bond? A. On your statement that is correct.

It was next brought out that out of the proceeds of the $32,000,000 bond issue an extra dividend of $6,669,180 was paid to the four gentlemen on their old Alton stock.

There was an item of $970,000 paid out on coupons of some prior lien bonds of the road, which suddenly seemed to have jumped from one side of the ledger to the other. Mr. Kellogg wanted to know how a debt of the company suddenly became an asset to swell its capital. Mr. Harriman said that he couldn't explain it.

"There must have been some mistake about it," he said. "I think it was carried during the time as a matter of interest on the books of the company by some mistake."

Q. Do you think that it would creep into the assets of the company from its debts without your knowing it? A. It evidently did in that case. It got there some way or another on your statement.

Following this came another mistake of the books, as Mr. Harriman put it, by which the sum of $12,444,177 did some jumping. There was no surplus at the time, but Mr. Harriman explained that when he got the Alton the finances needed readjusting. He said that this sum had been paid out on the road from the income, and that by the "readjustment" half of it had been paid back to the stockholders in the form of this extra dividend.

Q. Immediately after you got the property there was charged in the accounts of the company $12,444,177.60, construction, expenditures uncapitalized. Is that true? A. I presume that is just what is referred to.

Q. Is it not a fact that from year to year during the management of the prior Chicago & Alton whatever had been charged against its income and spent upon the road had been closed each year by the Board of Directors? A. I presume so; but under the former management of the Chicago & Alton the whole territory served by the Chicago & Alton was drying up very fast and so was the railroad itself.

Q. It certainly has not dried up since? A. No, sir; it has not.

Q. There is water enough to satisfy everybody? A. Yes, and business enough to satisfy.

Q. Would you think distributing $6,669,000 as a 30 per cent. dividend to the stockholders who had already had 8 per cent. would prevent it from drying up? A. Combined with the other methods of financing which were adopted by the Chicago & Alton, yes.

Q. The 30 per cent. dividend was paid on May 7, 1900, soon after the acquisition of the property by the syndicate, $6,669,180? A. Yes, it was 1899. I guess that is right.

Q. Now, $12,444,000 was money which the Chicago & Alton railroad had spent on betterment or improvements of its property during a long period in the past, back in 1898, was it not? A. No doubt about it.

Q. Or money which the original stockholders had lost in their investments, isn't that true? A. What difference does it make whether it is original stockholders or stockholders then in existence?

Q. Do you think that money lost twenty years ago should now be paid? A. I only know that the road cost a good deal more than the capital, and the Directors decided to reimburse the stockholders in this amount.

Commissioner Prouty: You and three other men bought $32,000,000 of bonds at 65 and with the proceeds declared a dividend of 30 per cent., and some of the remaining $8,000,000 of the bonds were sold for 90 and 95? Do I understand it correctly? A. Yes.

Mr. Kellogg: Didn't you four men organize the Alton Railroad? A. I suppose we did. You are trying to show that we sold bonds for less than they were worth. Well, suppose that we did?

Q. Weren't all the bonds of the $22,000,000 issue sold to you four men? A. I don't remember.

Q. Didn't these 3 per cent. bonds that you sold to yourselves for 65 sell in the market for 93? A. Did they? Didn't know they went to 93.

Q. Then if you men got these bonds for $13,000,000 you made a profit? A. I suppose we did. That's what we bought the Alton for—not to lose.

Q. When you bought the railroad company it was capitalized at $39,000,000 par value? A. Yes.

Q. From that time until last October, when you got out, the capital was increased to $122,872,327? A. Yes.

Q. How much of this increase was invested in the property itself? A. I will tell you if you will let me; $22,500,000.

Q. Now, isn't the $60,000,000 water? A. Isn't any doubt about it.

Q. Do you consider Alton worth $40,000,000? A. Yes.

Q. And you don't consider the 3 per cent. bonds worth more than 65? A. That was a privilege granted to the stockholders.

Q. Couldn't these bonds have been sold in June for more than 65? A. I don't know; market conditions change.

Mr. Harriman: It seems to me that too much importance has been attached to what counsel calls overcapitalization. There has been expended on the Alton on improvements $22,000,000 or over. The income resulting from that improvement has increased from $5,500,000 in 1898 to $11,500,000 in 1906. That increase is because of expansion permitted by the improvements. The rates charged for freight were 30 per cent. greater in 1898 than in 1906; business has expanded threefold. If the same rate prevailed in 1906 as in 1898 the net income would be $2,250,000 more. The syndicate found itself in the position of having paid $42,000,000 for the stock and property, less $6,000,000 it received in dividends, or $36,000,000. Now, the return of about $1,600,000 a year is less than 4½ per cent. on the money invested. It would seem as though it was not a very liberal distribution, but we took all the chances of what the markets might be, and the common stock was somewhat in relation to what you might say discounting the future. In 1898 we were just beginning to emerge from the depression of 1893 and the shock of 1896. It was doubtful when we bought the Alton if we could sell our bonds at 65. The next few years made great changes in values. I want to say that I don't believe Alton could be duplicated for the amount of the bonds outstanding. Nearly 50 per cent. of the holders of the Alton preferred declined to sell, believing that it was worth more. The Rock Island wanted the Alton's line from Kansas City to Chicago. The Union Pacific was to co-operate with the Rock Island, using the Alton between Kansas City and St. Louis. It was not a stock transaction pure and simple, but a transaction which carried with it supposedly an alliance which would benefit the Chicago & Alton, the Union Pacific and Rock Island. As time went on, the Rock Island people seemed to have changed their minds. They did not use the Alton, and this precluded the Union Pacific from tying itself up with the line from Kansas City to St. Louis."

SALE OF SOUTHERN PACIFIC STOCK TO WILLIAM ROCKEFELLER.

Q. I notice that your statements show that since that time, since the acquisition of the other 150,000 shares in 1902, I believe, that at all times since either the Union Pacific or the Short Line has owned 900,000 shares of Southern Pacific common stock. Now, where did you get the 300,000 shares of stock that you sold to William Rockefeller on March 13, 1903? Is that a part of the 900,000 shares? A. Yes, sir. This was a reciprocal agreement between Mr. Rockefeller and myself. He was to have the privilege on the 1st of May, 1904, to deliver the stock back to us at the same price at which we sold it to him, and a reciprocal agreement on our part that we were to have the privilege to take it back. It was a protective measure pure and simple. There had been a syndicate or a pool formed in Wall street to speculate in Southern Pacific stock, and they were said to have acquired about 300,000 shares. They had appealed to the stockholders and had appealed to the courts, and had tried to get enough proxies with their stock to prevent us from continuing in the management of the Southern Pacific, and to force in some way a distribution to the stockholders, so that they could get a market for and sell their stock out to advantage. We were fearful that they might get a temporary injunction and prevent us from voting on the whole 900,000 shares of stock, and in order to protect us against such a condition we took this method of disposing of enough stock, we thought, that would enable us,

with the proxies that we might obtain from the other stockholders, to control the election as against this speculative syndicate. It was purely to protect the interests of the Union Pacific or Short Line stockholders. We wanted to get 300,000 shares of stock in the ownership of somebody who would act against the attempt of this speculative pool to control the property. The annual report of the Southern [Union, Ed.] Pacific was not approved by its Board of Directors until after November 12, 1903. It has been the custom of the comptroller to hold his books open until after the annual report has been approved by the Board of Directors. Now, then, when this stock was returned in November, on November 12, some six months prior to the time of the agreement at which Mr. Rockefeller was to have the right to return it to us, the comptroller made his entries as of June 30, 1903, and that was the reason that the 300,000 shares were not shown to have been disposed of during that year.

THE INTEREST IN THE SANTA FE.

In regard to an interview with Mr. Ripley or Mr. Morawetz, of the Santa Fe, Mr. Harriman said:

"It was in substance that we were to try to establish better relationship between all the railroads, in the line that we should deal more frankly with each other, more publicly and more frankly, and not operate our lines for the purpose of destroying each other, but for the purpose of helping each other, and for developing the territory served by each, and to that extent I even went so far with Mr. Morowitz as to tell him that as far as the Southern Pacific was concerned I would be willing to even put him on the executive committee of the Southern Pacific, so that he might know what our intentions were, if he chose to. After considerable talk on those lines, they concluded that they would give representation—not to the Union Pacific Railroad—for I cannot say that it was representation for stock that was owned by myself and some of my associates, but that they would elect to the Atchison board two men that were suggested by us, and to that end they elected Mr. Rogers and Mr. Frick."

Chairman Knapp: Was there any corresponding arrangement by which the Directors of the Santa Fe were elected to the directory of the Union Pacific?

Mr. Harriman: No, sir.

The Chairman: So that, in point of fact, up to this time there is no officer or director of the Santa Fe who is also a director of the Union Pacific, the Southern Pacific, or the Atchison?

Mr. Harriman: I think not.

THE SAN PEDRO, LOS ANGELES & SALT LAKE.

Mr. Kellogg: The San Pedro Railroad, from Salt Lake to California, is also under joint control, between the Union Pacific and Mr. Clark? A. Yes; but we built that road jointly with him.

Q. Jointly with him? You sold him 512 miles belonging to the Short Line company did you not? A. For the purpose of enabling the line between Salt Lake and Los Angeles to be completed quicker than it otherwise could have been.

Q. That is, you contributed to that line of railroad 512 miles; is that correct? A. Undoubtedly.

Q. Mr. Clark contributed some money and some railroad that he had been building? A. Yes, some insignificant lines.

Q. And you put into it a railroad, and the Union Pacific or the Short Line and Mr. Clark owned the securities jointly? A. Yes.

Q. You provided for a joint management? A. Yes; we developed a new railroad.

Q. And you brought the Southern Pacific into that with a contract? A. And opened new avenues of traffic.

Q. Yes, but they all lead to the same place, the Union Pacific? A. I hope so. The Union Pacific is quite capable of doing it.

THE ILLINOIS CENTRAL PRESIDENCY.

Some influence was exerted to change the president, was it not, after the acquisition of Illinois Central stock by the Union Pacific? A. Do you want me to tell you about that?

Q. I just want that question answered. A. I will tell you how the change in the presidency of the Illinois Central took place. In September, 1903, after I had been abroad about three months, on arriving here I was approached by several of the influential directors of the Illinois Central, asking me of the advisability of reporting certain acts of the president of the Illinois Central to its Board of Directors, with a view of having them request the president to resign at that time. I took steps to smooth over the difficulty which had arisen, and which showed that the president of the Illinois Central had been using his position as president to further his own personal interests. I prevented action by the Board of Directors at that time, in the interest of the president, and retained him in office, but subsequent to that he continued to act in the same line, and the Board of Directors of the Illinois Central, purely and simply from the interests of that company, took steps to relieve him from that position.

RATES, CAPITALIZATION, TRAFFIC AGREEMENTS AND CONSOLIDATIONS.

Commissioner Lane: Q. I would like your opinion upon this, Harriman: Why should the Union Pacific, as a railroad, be empowered or have the right, out of its credit as a railroad, to buy other railroads? A. Mr. Lane, it is a pretty broad question and pretty hard to answer it offhand. It would require a great deal of deep thought. If we had not had the power to buy the Southern Pacific with the credit of the Union Pacific, the territory of the Southern Pacific would have been 10 years behind what it is now. If we had acquired the Northern Pacific, the Northern Pacific territory would have been 10 years ahead of what it is now.

Q. Then you think, also, if you acquired the Santa Fe you might improve that? A. That is a very different question. I believe we could. I believe under proper regulation and proper statutes, which would enable railroads to combine and establish lines upon which traffic could be moved at the least cost, we could reduce our rates; but just so long as we are prohibited by law from agreeing among ourselves, without the danger of being sent to state prison, you have this chaos that now exists. Just as soon as we can get laws that will enable us to combine and establish these lines, so that we can conduct the traffic on the lines of least resistance, at the least cost, we will then be able to reduce the charge and also to increase wages or to stand the increase in wages, and not before.

Q. What is the law that you would want that would bring about this beneficial result? A. A law that would enable corporations to make contracts between themselves, under proper regulations, just the same as individuals have the right to make contracts—contracts that would be standing and enforceable for a long term of years, so that it would enable railroads to establish these lines upon which traffic could be moved at least cost, taking various parts of the lines as they now exist. If there had been such a right the purchase of the Burlington by the Northern Pacific and the Great Northern might not have taken place.

Q. What competition would there then be between railroad lines? A. As I said, it should be under proper regulations. I do not think it is to the advantage of the business interests of this country to force business around on improvident up and downhill lines when there is a straighter and more economical line to be used. I do not mean to say that no business ought to be allowed to go over that line, because there are other conditions sometimes when the less fortunate line can do business to better advantage and at less cost; that is, in filling out its trains. But there should be some law—and I think the President of the United States had that in his mind when he sent his message to Congress last December; I do not remember his exact language—that there should be under some proper control, a change in the laws which would enable contracts to be made between railroads.

Q. As a matter of fact, there are perhaps 220,000 miles of railroad in the United States. Are there 2,000 miles that you know of that are actually competing in rates? A. I think every mile is.

Q. You know all the rates are made by bureaus and after consultation with each other? A. I don't know that. I know this, that in the struggle for business, the traffic managers of the railroads try to fill out their trains, and they take the business at the best terms they can get, as a rule, in order to do that. That is true even in your local business; that is, competitive business. There is not a point on the Union Pacific that is not competing with a point on the Atchison—that is, situated under the same conditions, although they may be 200 or 300 miles apart. If we are going to develop the traffic and the industries along our transportation lines, we have got to give the same service that exists at similar points on another railroad, or better service, no matter whether it is local or not.

Commissioner Harlan: I understood you to say that you thought it would be a wise thing to have a law permitting the consolidation of railroads. A. The combination of lines; I don't say consolidation of railroads.

Q. The combination of lines, rather, and that it would result in the connections to the roads and possibly reflect itself in the rates; that is, giving lower rates to the people. A. Yes.

Q. And that if such a law were passed you thought it would also be wise to have this Commission, or some other power, to review and pass upon the terms of such a combination? A. That is right, as to whether they were proper.

Q. Well, I understand you are looking forward to a time when there will be dividends on this common stock of the new Chicago & Alton? A. Well, I think if we had been able to maintain the same rate in 1906 and 1905 that was charged in 1898, that we would have been paying 8 or 10 per cent. or 11 per cent. on the common stock of the Chicago & Alton. We expected, by putting this new money into the Chicago & Alton, to give the territory tributary to it an opportunity to expand and to increase the volume of business that would pass over the Chicago & Alton; but the benefit was all absorbed in the reduction of the rate.

Commissioner Lane: Supposing you concentrated two or three roads more, you might take some other line and go right into New York? A. Suppose we had a line from New York to San Francisco—I suppose that is what you mean—would it not be a good thing—not that we have any idea of doing it, but would it not be a good thing?

Q. Supposing that you got the Santa Fe? A. You would not let us get it.

Q. How could we help it? A. How could you help it? I think you would bring out your power to enforce the conditions of the Sherman Anti-Trust act pretty quick. If you will let us, I will go and take the Santa Fe to-morrow.

Q. You would take it to-morrow? A. Why, certainly I would; I would not have any hesitation. It is a pretty good property.

Q. Then it is only the restriction of the law that keeps you from taking it? A. I would go on as long as I lived.

Q. Then after you had got through with the Santa Fe you would also take the Northern Pacific and Great Northern, if you could get them? A. If you would let me.

Q. And your power, which you have, would gradually increase as you took one road after another, so that you might spread not only over the Pacific coast, but spread out over the Atlantic coast? A. Yes; but hasn't your organization increased its power?

Q. It undoubtedly has. That is what I am coming to. Do you think the law itself should intervene there and should restrict you in your power to use money raised for railroad purposes and raised on railroad securities to the actual improvement of that railroad, or should you be allowed to use it for the acquisition of other railroads? A. I think we should be allowed to use it for the acquisition of othe railroads, under proper regulation.

As the law exists, railroads are prevented from consolidating or combining. Take the instance of the Burlington and Great Northern and Northern Pacific. It was not a good thing for the Northern Pacific and the Great Northern and Burlington or for the Northern Pacific and Great Northern to buy all the stock and eliminate from the situation 15,000 or 16,000 small stockholders. That is what they did. They turned those 15,000 or 16,000 small stockholders from stockholders into creditors, so that they were eliminated from the development of the business on the lines of railroad. They did not care anything about it so long as they got the interest on the bonds. Now, if we had some legal method whereby the Burlington and Northern Pacific and Great Northern, under some legal restriction, had been permitted to make contracts by which they could approximately have accomplished the same thing, it would not have been necessary to issue the $200,000,000 of bonds to acquire the Burlington stock, and the ownership of these securities would have been in the hands of the people, where I believe it is better it should be.

Q. And you want the powers of the company still further increased—— A. (interrupting). I cannot say that I do, unless we have our own powers increased.

Q. You want your powers increased so that you can combine, and you want us to have power in the first place to insure the rate? A. Yes, to regulate and go hand in hand with us.

There is no other country in the world where the business interests are so antagonized by the government as this one. In any other country in the world the government takes a practical interest in encouraging transportation facilities.

Mr. Harriman declared there should be no limits to the profits a railroad could make nor to the dividends it might pay so long as it kept up its property and maintained rates no higher than those given by other systems.

"What would you have us do with the money?" he asked. "Give it to the government?"

"No," said Commissioner Clements, "but there are several ways by which you might give it back to the shippers."

Operating Features of the Chicago Freight Tunnels.*

There are now 46 miles of tunnels completed, reaching beyond the Chicago river, north and west, and going under the river in 11 different places. Further extensions are to be made. The bottom of the tunnels is about 40 ft. below the street level. The tunnels now cover the territory from Erie street, eight blocks north of the river, to 16th street on the south, and from Lake Michigan to Halsted street, five blocks west of the river. Permanent track has been laid in 41.53 miles of the subway, and 39.67 miles of permanent trolley has been installed.

Except in several instances of steep grade where the tunnels are brought to the surface, the overhead trolley is the only means of motive power. On one or two of the grades mentioned a rack-and-pinion arrangement is used for safety and tractive power.

There are now in operation in the tunnels 65 electric locomotives and 590 cars. The locomotives are of several types, and were built by the Morgan Electric Machine Co., of East Chicago, the General Electric Co., Jeffrey Manufacturing Co., of Columbus, and the Goodman Manufacturing Co., of Chicago. The Baldwin Locomotive Works is now building still another locomotive for trial.

By February 1, 1907, all of the railroad passenger stations in Chicago were connected with the Post Office through the tunnels. Nine of the principal railroad freight houses had tunnel connections and others were being connected. Two coal-carrying railroads have special connections for carrying coal to the basements of downtown buildings. At present some 20 of the large buildings in the business district have their basements connected with the tunnels and have underground freight service.

The first freight business done by the tunnel company was the removal of earth from excavations in the preparation for the construction of new buildings. This is now an important part of the company's business. This plan has many advantages over the old method. In the construction of several large buildings all the earth excavated was lowered into the tunnels and taken to the dumping grounds, and new material for the foundations taken in through the bores, with no inconvenience to the public. By the tunnel method there was removed from one basement over 2,100 cu. yds. of excavation of 24 consecutive hours. The best record by teams in 24 consecutive hours, under similar conditions, is said to be 420 yds., and to do this the contractors were required to stop overhead work entirely. The tunnel method allowed the progress of overhead work without hindrance. Many of the newer buildings in Chicago are built with three- and four-story basements, so that the lowest basement is on a level with the tunnels. This offers opportunity for economical handling of coal and ashes and for loading and unloading merchandise. Where it is not practicable to sink sub-basements under buildings already built the tunnel connection is made by shafts, in which the cars are raised and lowered by electrically operated elevators. This is also the usual method of making the railroal freight-yard connections. From a railroad freight house tunnel cars are individually lowered into the tunnel by an elevator. The locomotive is not raised to the surface; the cars, when not easily movable by hand, are drawn to and from the elevator platform by a cable. Besides the coal and ash handling done through the tunnels, the freight yards and stores connected transfer much of their freight and merchandise in the tunnel cars. Merchandise trains are usually made up of seven or eight cars.

The tunnel company has for some time been transferring United States mail between the Post Office and the railroad stations, thereby permitting the removal of most of the clumsy mail wagons from the streets. Some trouble was encountered in getting this service into working order, which might be expected when the size of the undertaking is considered. Officials of the company are confident the service will prove satisfactory to the Government. In one day last month 772 mail trains were run. They carried 27,250 mail bags, 2,209 parcels and 63 packages. The report of earnings from the subway for the year 1906 gives the amount as $221,176, compared with $108,300 for the year 1905. The present year will probably see this amount greatly increased.

*Abstract of an article in the Western Electrician, Feb. 23, 1907.

Derailment of Pennsylvania Special—Report of Committee on the Cause.

On the night of February 22, about 11:42 o'clock, Pennsylvania Railroad train No. 29, the 18-hour express from New York to Chicago, was derailed on a curve at Mineral Point, Pa., about seven miles east of Johnstown, and three of the four cars fell down a high bank into the Conemaugh river, lodging in about two feet of water. The train had left Altoona about 40 minutes late, and is said to have been running at about 50 miles an hour. The number of passengers on the train was 54, and reports say nearly all of these were injured, but none fatally. The engine was one of the company's standard Atlantic type.

Mr. W. W. Atterbury, General Manager of the road, at once appointed a committee of three to investigate the wreck, determine if possible its cause, and report to him. The men composing this committee were Mr. A. C. Shand, Chief Engineer, Mr. L. R. Zollinger, Engineer of Maintenance of Way, and Mr. H. M. Carson, Assistant to the General Manager. Their confidential report to Mr. Atterbury has been made, and its text, given out in full by the company, follows. In accordance with the committee's suggestion, the 3,000 steel ties which had been installed as an experiment will be removed.

REPORT.

Mr. W. W. Atterbury, General Manager.

Dear Sir:—Your committee appointed to investigate the cause of the accident to train No. 29 west of Mineral Point, on the Pittsburg division, on the night of February 22, arrived on the scene about four o'clock on the afternoon of the 23d. Previous to our arrival No. 3 track had been rebuilt for the entire stretch and was in service. The wreck occurred on the section of track laid with experimental Carnegie steel cross-ties, the first indication of derailment being a point 287 ft. west of the east end of these ties, and on a 3¼ degree curve to the left. The track had been torn up from this point a distance of 1,244 ft., where the locomotive stopped.

[A plan is shown, from which it appears that the combination car stopped 594 ft. short of the locomotive, and that the other three cars fell down the bank to the right, lodging on their sides partly in the shallow water of the Little Conemaugh river.]

All of the wheels of the locomotive and tender were on the track,

according to the best evidence obtainable, except the two rear wheels of the rear tender truck, which were off the track and lying between the rails. The combination car remained on its trucks, although all the wheels were derailed. The high rail was found clear of the ties on top of the embankment. The outside bolt fastenings had been sheared and snapped off the entire distance of 1,244 ft., the point the locomotive stopped. As evidence of the force with which these bolts were broken off, some of them were found in the river bed about 200 ft. from the track. The steel ties were badly crushed. We also found that the inside clips on the low rail had been badly damaged by the derailed wheels, and these had also broken pieces out of the base of the rail at intervals, although it was not thrown out of its original position. At the point of the accident, the first splice bar ahead of the point of derailment, on the high side, was broken through the second bolt hole and bent outward by a lateral thrust.

We then went to Altoona, interviewed the engineer and fireman, and examined the locomotive and trucks in the enginehouse. The engineer's statement was that he had been making a good run down the western slope, but at no place was running at an excessive speed; and before striking the stretch of steel ties, he made an eight pound reduction of his air to steady the train, as was his custom. He states positively that before he appliled his brake he was not going more than fifty miles an hour, and record taken from the train sheet corroborates his statement. An instant after he applied the air, he felt the emergency go on and, thinking it was a burst hose on the train, released his air and looked back, when he saw the cars going over the bank. He reapplied his brake, and as soon as he stopped, got down to examine the locomotive, the fireman going ahead to flag the eastbound track. He found the two rear wheels of the rear tender truck derailed and between the rails and the brake beam down on the left side, pressing against the flange of the left rear wheel. The brake shoe, half the brake hanger and the brake head had been lost from the left side of the brake beam. The beam was supported on the right or high side by its brake hanger, and the shoe was in place. An examination of the locomotive in the enginehouse afterwards corroborated the engineer's statement, a piece of the brake hanger and part of the brake head having been subsequently found along the track, the brake head 500 ft. and the half of the brake hanger 264 ft. back of the point where the locomotive stopped. No part of the brake shoe has been recovered, although search was made for it. This is not surprising, however, considering the fact that the roadbed was badly torn up for a distance of five or six hundred feet and had been replaced. We afterwards made an examination of the brake beam and found that the end on the left side had been caught under the flange of the wheel, as the mark made by the flange plainly indicated, although the abrasions on the end of the beam were hardly sufficient to indicate positively that the beam came down at the time of derailment and had dragged the entire distance. It should also be noted that an examination of the two parts of the broken brake hanger, which was rectangular in shape and made of one piece of three-fourths inch iron, showed that one corner of it had been worn by the flange of a wheel at some previous time, although in this condition it was strong enough to withstand ordinary service.

It seems to be the impression of those division people who were first on the ground, that the accident was primarily caused by the brake beam falling down on one side. At the same time, it is impossible for us to definitely attribute the cause of the accident to that source. A portion of the torn-up track had been renewed with wooden cross-ties before we reached the ground and was in service for trains at slow speed, so that we are unable to definitely attribute the cause in any way to defective track. We made careful inspection of the track of steel tie construction ahead of the portion damaged by the wreck and therefore not affected thereby, a distance of about half a mile, and found it in first-class condition, all the outside clips being tight against the base of the rail, the bolts on the inside, with few exceptions, being tight, holding the clips in condition, the line and surface being as nearly perfect as it was possible to get track, and the whole mass of steel crossties frozen tight to the ballast and not the slightest indication of shifting in any direction whatever; nor was there the slightest indication of movement on the top of the steel crossties by any of the rails for the entire distance.

If the accident had occurred on the section of track laid with wooden cross-ties, it is our judgment that less injury would have been done to the track structure for, after the one pair of wheels of the tender of the locomotive was derailed, the bolts of the outside of the high rail were snapped off throughout the entire distance the tender was derailed; the rail on this side having been shoved out and off the end of the cross-ties. A large portion of this rail was simply lifted back into position and with new bolts and clips again placed in service, as there was little injury done to the steel cross-ties west of the point where the combination car stopped.

We are unable to definitely account for the cause of the accident, but the best reason for it that we can advance is, that at the point where derailment occurred some foreign material became wedged between the flange of the left rear tender truck wheel and the inside or low rail, which, on account of the rigidity of the steel ties and fastenings, and on account of the low temperature, the temperature being 12 deg. F. below zero, produced sufficient lateral force to shear the bolts on the outside rail. It is possible that this foreign substance was the brake shoe or a part thereof, which, as before stated, has not been found. We are informed that the usual inspection was made of the locomotive before leaving the enginehouse, and the gage of the wheels was measured in our presence after the accident and found to be correct.

We are of the opinion, on account of the lack of positive evidence as to the cause of this derailment, and on account of the fact that the damage subsequent to the derailment was more serious than would have been the case with wooden ties, that the remaining steel ties should be removed.

A New Form of Suspension for Contact Wires.

BY JOSEPH MAYER.*

There are two fundamentally different designs of overhead contact wires in use: copper wires suspended at distances of about 100 ft. and copper wires suspended from one or two steel ropes at more frequent intervals varying from 10 to 50 ft. Ganz & Co., Budapest, made experiments for two years with various kinds of rope suspension, but they adopted for the Valtellina line a wire without ropes. This did not prove satisfactory and ropes are reported to have been later adopted. For the Simplon tunnel approaches a double wire without ropes is used.

For the purpose of finding a satisfactory design it is advisable to investigate the reasons why all the designs so far adopted are defective. The sum of the strains from all the incident forces in any member of a structure should be smaller than the elastic limit of the material of this member. It can be shown that the designs so far used which have not proved satisfactory, even with the present limited speeds, and which will be still more inadequate with the maximum speeds of steam railroads, do not meet this requirement.

The strains in the contact wire arise from the following incident forces:

1. Weight of the wire.
2. Wind pressure.
3. Pressure of the sliding bow.
4. Resultant pull at the suspenders.
5. Changes of temperature.

The weight and the wind pressure produce over the whole length of the wire a tension depending in amount on the size of the wire on the deflection, and on the span. It is given by the formula, $T = \frac{PL}{8D}$ where T is the horizontal component of the tension in the wire with small deflections approximately equal to its total amount. L is the length of the span in feet and P is the total force per span acting on the wire normal to it. $P = L\sqrt{w^2 + p^2}$ where p is the weight and w the wind pressure per foot of wire. The deflection D varies with the length of the wire and depends on the tension and the temperature.

The tension is, however, not the only, or even the most important strain in the wire with the usual manner of suspension. The pressure of the sliding bow produces bending strains in the contact wire. For a 00 round wire the bending strain per square inch is approximately $s = 14{,}000\ \frac{Q}{\sqrt{T}}$ where Q is the pressure of the sliding bow and T the tension in the wire in pounds. For a 0000 round wire the formula is $s = 12{,}000\ \frac{Q}{\sqrt{T}}$. These formulas are approximately correct.

The most important bending strains occur at the suspenders. These are usually short clamps gripping the wire, which leaves them in a direction either horizontal or slightly inclined downward. Assuming at the end of the clamp a downward slope of the wire equaling the average vertical end slope of a flexible wire, the direction of the wire where it leaves the clamp is that of its position without wind pressure. Changes of temperature produce changes of the vertical end slope of the wire, and the wind pressure produces horizontal changes. With the usual clamps and with long spans bending strains are produced beyond the elastic limit of the wire, either alone or, at least, when the strain due to the tension is added. When a wire is fixed as in a clamp and exposed to a tension T, acting in the direction of the wire, and a force Q, normal to it, the wire bends downward. The bending strain where the wire leaves the clamp is approximately for a 00 round wire $s = 28{,}000\ \frac{Q}{\sqrt{T}}$; for a 0000 round wire $s = 24{,}000\ \frac{Q}{\sqrt{T}}$.

For long spans these bending strains produce alternately above and below and to the right and left, tensions beyond the elastic

*Consulting Engineer, 1 Broadway, New York City.

limit. They arise from changes of wind and temperature, and produce after considerable time fracture of the wire.

In a 00 wire with 200 ft. span and 4½ ft. maximum vertical deflection, the deflection with the temperature 140 deg. lower is 2.02 ft. The mean deflection of this wire is 3.26 ft. and the mean end slope of a flexible wire is 6.52 per cent. I shall assume that the vertical slope of the wire where it leaves the clamp is 6.52 per cent. so that there is no vertical bending with the mean vertical deflection. This wire weighs 0.4022 lbs. per ft., and the weight of the half span is 40.22 lbs. The tension in the wire at maximum temperature is 447 lbs., or 4,277 lbs. per sq. in. Where the wire leaves the clamp the vertical component of the tension is 0.0652 × 447 = 29.13 lbs. The clamp carries from one side 40.22 lbs. The force Q normal to the wire where it leaves the clamp is 40.22 — 29.13 = 11.09 lbs. (approximately). The bending strain is $s = 28{,}000 \times \frac{11.09}{\sqrt{447}} = 15{,}560$ lbs. per sq. in.

With maximum wind pressure normal to the wire the pressure is approximately 0.365 lbs. per foot, or 36.5 lbs. per half span. The tension in the wire is then 590 lbs. The bending strain due to wind pressure is $s = \frac{28{,}000 \times 36.5}{\sqrt{590}} = 42{,}080$ lbs. per sq. in. To this must be added the tension of 5,636 lbs. per sq. in. It is evident that the total strain is beyond the elastic limit of any copper wire.

The vertical bending downward of the wire at the maximum temperature has another effect harmful to it. The strain per square inch due to vertical bending at the end of the clamp is 15,560 lbs. The radius of curvature of the wire produced thereby is given by the formula $s = \frac{r\,E}{R}$ where r is the radius of the wire, R its radius of curvature and E the modulus of elasticity = 20,000,000 lbs. for copper. This gives for our case $R = \frac{0.1825}{15{,}560} \times 20{,}000{,}000 = 234.6$ in. = 19.55 ft. The sliding bow moves along the wire when the wire is convex upwards as in this case. The centrifugal force due to the curved motion increases the ordinary pressure of the sliding bow. This centrifugal force is $C = \frac{W}{32.2} \times \frac{V^2}{R}$ where W is mainly the weight of the sliding bow and of its rigidly attached parts moving in the same manner. G is 19.55 ft., V is the train velocity. The contact wire should on some roads be safe for a velocity of 80 miles per hour, or 117.33 ft. per second. Introducing these values in the formula we obtain $C = \frac{W \times \overline{117.33}^2}{32.2 \times 19.55} = 21.88$ W. W is at least two pounds. The total pressure of the sliding bow becomes so large that it produces bending strains near the clamp beyond the elastic limit.

From the foregoing it is evident that the wire should not be convex upward after leaving the clamp, or if so, the radius of curvature should be so large as not to increase the pressure of the sliding bow to a dangerous extent. The wire should leave the clamp in a direction approximately identical with the direction of the resultant pull which depends on the varying vertical and horizontal deflection. The wire must bend up and down and to the right and left, but this bending should be in circles of large radius so as to keep the bending strain within moderate limits. The radius of curvature of the wire where it is convex below should preferably be large enough to prevent the momentary breaking of contact between wire and sliding bow, due to centrifugal force, and the consequent sparking.

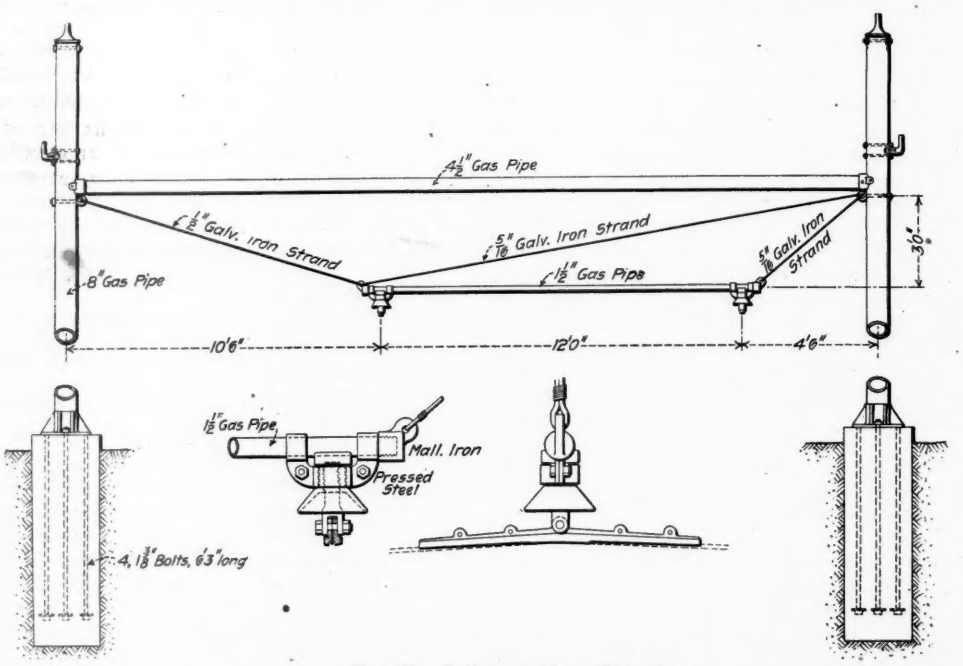
These ends are attained by the suspender shown in the drawing, which is a design for a suspender for a copper contact wire No. 00 (.365 in dia.) for a 250-ft. span with a maximum vertical deflection of 3 ft. It is suitable without the use of strain adjusters where the variation of temperature does not exceed 84 deg. Fahr. Where this variation is greater, as in most cases, it must be used in combination with suitable strain adjusters placed about a mile apart, by means of which the length of the contact conductor can be changed twice or four times a year so as to reduce the changes in length to the equivalent of a variation of temperature with one length of contact conductor of 84 deg. Fahr.

The suspender consists of two castings of malleable iron or other suitable metal, firmly bolted together. For the 6 in. in the center the sliding bow runs along the cylindrical bottom surface of the suspender, a radius of 5 ft. 2⅜ in. convex upward. It exerts an upward pressure on the casting and not on the wire. For ease in manufacture this central part of the suspender contains a straight horizontal channel 2 in. long wherein the wire is protected from contact with the sliding bow but does not touch the walls of the channel. Beyond the ends of this channel are two straight tubes each 2 in. long with a vertical slope equal to the largest vertical end slope of the wire, and a horizontal slope equal to that of the wire without wind. These tubes firmly grasp the wire. The bottom of the wire, 3 in. from the center of the suspender, is tangent to the cylindrical bottom surface of the suspender. The design here shown has for its essential feature the direction and position of the wire where it leaves this part, and the fact that the wire is firmly held to this direction and position and is protected from large bending strains due to the upward pressure of the sliding bow. This central part is substantially the same in its function, if not in its exact details, to the whole suspender of the usual designs.

The wire emerges from the central 6 in. of the suspender into two rectangular channels each 11 in. long. Here the sliding bow runs along the bottom of the wire and does not touch the bottom of the suspender, which is above the former. The upper walls of these rectangular channels are cylindrical surfaces which are tangent to the wire at points 3 in. from the center of the suspender. The radius of these cylinders is 44 ft. 6 in. The wire can therefore bend up to a circle of this radius. It will leave the suspender with a vertical slope at most ½ per cent. greater than the vertical end slope of a flexible wire in its highest position which occurs at minimum temperature with maximum wind pressure. The bending strain due to the vertical bending is 6,835 lbs., and never exceeds this amount. The two vertical walls of the rectangular channels are cylindrical surfaces with the same radius and also tangent to the wire at points 3 in. distant from the center of the suspender. The bending strain due to lateral bending is 6,835 lbs. per sq. in. The total bending strain due to lateral and vertical bending is $6{,}835\sqrt{2} = 9{,}668$ lbs. per sq. in. This occurs with the maximum tension produced by weight and wind pressure at minimum temperature. The wind pressure is 21,475 lbs. per sq. in. The total maximum strain is therefore 31,743 lbs. per sq. in., which is well below the elastic limit of a hard drawn copper wire of this size.

The suspenders are alternately 3 ft. to the right and left of the center line of track. This causes a lateral deflection of the wire without wind of 6 ft. in 250 ft., or 2.4 per cent. This necessitates a corresponding lateral deviation of the center lines of the two halves of the suspender. The wear of the sliding bow is by this arrangement distributed over most of its length.

The design here shown saves carrying ropes and suspension

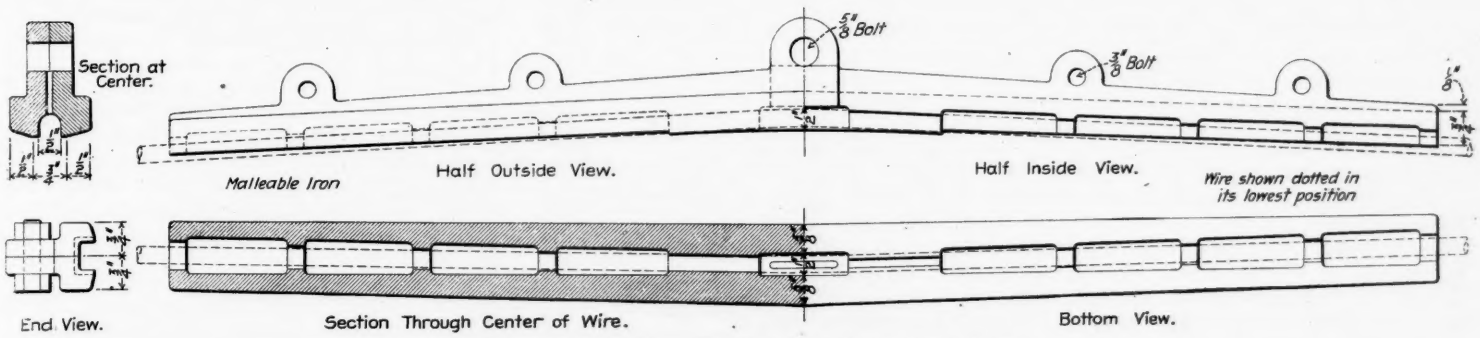


Detail of Supporting Structure.

frames at short intervals. The small round wire exposes little surface to the wind and the small weight carried produces small longitudinal forces in case of rupture; a very light supporting structure can therefore be used. With a special sliding bow the size of the wire required will be governed mainly by the conductivity needed. The wire most suitable for this design is a round wire since it receives the smallest wind pressure. A contact wire of the design proposed weighs about one-quarter and receives about one-sixth as much wind pressure as a grooved contact wire with double rope suspension for 300-ft. spans.

The writer estimates that with steel construction about $3,000 per mile of double-track will be saved by this design, and that the cost of maintenance will be reduced in still larger proportion.

For lines of small traffic with moderate maximum speeds timber construction for the supporting structure is the cheapest method. A suspender similar to the one described, but designed for different end slopes, can be used with spans of about 200 ft. without strain adjusters. It will be cheaper and safer than the single or double catenary suspension. Spans of about 300 ft. can be used with strain adjusters. Smaller wires than with the present methods are practicable and safe with a special sliding bow hereafter described and by means of high voltage a cheap and safe design becomes possible. A single pole line with hinged brackets permitting slight motion of the suspenders in the direction of the line can be used or two-pole lines with span wires are suitable. One of the drawings shows a steel construction for 250 ft. spans suitable for double track. The two suspenders are hinged to insulator pins. These latter are fastened to 1½-in. gas pipes by means of insulators suitable for the voltage adopted. To the ends of these gas pipes three strands are attached connecting them to the two posts. These are 8-in. gas pipes, standing in and bolted to cast-iron bases, which are anchored to concrete blocks 2 ft. 3 in. x 2 ft. 3 in. x 7 ft. buried in the soil. The two posts are connected on top by 4½-in. gas pipes by means of malleable iron coupling pieces and bolts. On the top of the posts are insulators. On the side of each post is one other insulator for a telephone or signal wire. The feeders and other wires should be fastened to the insulators so that they can slide without excessive friction. In case of a derailment one post or a pair of them may be overthrown and all the wires of an adjacent span ruptured. The nearest contact wire suspenders will then swing away from the break and will increase the deflection of the adjacent spans of the contact wires and reduce their tension. The feeders and other wires will slide over the adjacent insulators and will spread the one-sided pull over several posts. To limit the disturbance caused by a derailment to a short distance, the strain adjusters should be firmly attached to bridges able to withstand the one-sided pull. All the wires should be firmly attached to the insulators at the posts carrying these bridges so that they cannot slide.



Detail of Suspender for High Speed Contact Wire.

Sliding Bow.

At high speeds the pressure of the sliding bow against the contact conductor varies with the degree of curvature of its motion. To make the bow move in a curve instead of in a straight line there must act on it a force having a component normal to the motion. This component called the centripetal force is given by the equation $C = \frac{W}{32.2}\frac{V^2}{R}$. W is the moving weight in pounds, V is the velocity of motion in second feet, R is the radius of curvature and C is the centripetal force in pounds. The greatest speed may be assumed at 80 miles per hour, or 117.33 ft. per second. If the sliding bow is not to leave the wire at the suspender where the radius of curvature is 44.5 ft. the upward pressure imparted to it must be at least equal to the centripetal force. This is $C = \frac{W}{32.2} \times \frac{117.33^2}{44.5} = 9.61$ W. A suitable sliding bow can be designed for W = 2.0 lbs. This gives C = 19.22 lbs.

The pressure between sliding bow and contact wire also varies with the rising and falling of the bow, which is generally held up by means of pneumatic pressure. When it rises the pressure on the piston overcomes the friction opposing the upward motion, and the remaining balance produces pressure on the wire. When the bow falls the pressure of the wire overcomes the friction opposing the motion of the apparatus and balances the air pressure. The pressure between wire and sliding bow is, therefore, much more when the bow falls than when it rises. Half the difference must be sufficient to overcome the friction and the friction should therefore be small. Other causes of variation of pressure between wire and sliding bow are the variation of air pressure and the nature of the mechanism between the air piston and the sliding bow.

The mechanism pressing up the sliding bow must be able, when the bow is near or at the suspender, to produce the centripetal force of 19.22 lbs. necessary to prevent the breaking of contact, otherwise the contact will be broken during about $^1/_{100}$ of a second at each suspender at minimum temperature with a speed of 80 miles per hour. The required pressure decreases as the square of the speed. At 60 miles per hour it is only 10.81 lbs., at 50 miles 7.5 lbs. At low speeds small contact pressures are adequate to prevent interruption of contact at the suspenders, even with smaller radii of maximum curvature of contact line than in the foregoing example.

The design of a suitable sliding bow proposed is not in its fundamental features original. The bow used in the Zossen high-speed experiments and that used in the Simplon tunnel are essentially, but not in their details, the same. They consist of a light part following alone the small and rapid undulations of the contact point, hinged and connected by means of springs to a heavier part following only the large and slow oscillations of the sliding bow. By means of this contrivance the weight of the light part alone determines the variation of contact pressure produced by the sharp but short curves of the contact conductor.

The light part should consist of one horizontal aluminum pipe of 1.315 in. outside, and 1.048 in. inside diameter, of 6 ft. 9 in. long. It is firmly attached to two radial arms 2 ft. 6 in. long, made of aluminum pipes of the same diameters; they are forced into hubs sitting loosely on a shaft. To this shaft spiral springs are attached which transmit the needed torsion to the radial arms for producing the desired contact pressure.

On the shaft, which runs in bearings at the ends of two poles, is a sprocket wheel which is turned by a chain going down to the hinge for the two poles, to another sprocket wheel turned by the piston rod of an air cylinder. The two main poles are held up to a sufficient maximum height by means of another air cylinder with piston, piston rod and crank.

Patents have been applied for on all the apparatus above described.

Supplement.

A defect in this investigation is its complicated nature and the necessity of trying a number of different maximum deflections for the purpose of finding the most favorable one. A number of trials with 0000 and 00 wires have shown that 300-ft. spans are quite safe, with 4 ft. maximum deflection with either 0000 or 00 wires, and that for 250-ft. spans a maximum deflection of 3.5 ft. will give much smaller maximum strains than one of 3 ft., and is therefore preferable. These results are important since the cost of the carrying structure is considerably reduced by the adoption of 300-ft. spans. Due to this fact I can safely assert that the cost of the carrying structure for double track here proposed is less than one-half that with designs using 300-ft. spans, two ropes per track and steel bridges.

The results summarized are as follows:

First.—0000 round wire, 300-ft. spans with strain adjusters. Maximum vertical deflection 4 ft.; maximum strain by tension and bending due to weight, wind, sliding bow and changes of temperature 30,315 lbs. per sq. in. The normal pressure of the sliding bow at slow speeds may vary between 21 and 42 lbs. without overstraining of the wire or sparking at the suspenders. The sliding bow must be 7 ft. 3 in. long center to center of radial arm. The suspender should be 2 ft. 6 in. long with a central portion 6 in. and two end channels each 12 in. long. The carrying structure may be either as shown in the drawing but with 4 ft. drop in the span wires, or a larger factor of safety may be used, resulting in 9-in. pipes for the two posts.

Second.—00 round wires and 300-ft. spans. Maximum vertical deflection 4 ft.; maximum strain in wire 30,400 lbs. per sq. in. The normal pressure of the sliding bow at slow speeds may vary between 23 and 35 lbs. Length of sliding bow 8 ft. 1 in. center to center of radial arms. The suspender needed is 2 ft. 6 in. long, with a central portion 10 in. long and two channels each 10 in. long. The carrying structure is the same as before.

Third.—00 round wires and 250-ft. spans. Maximum vertical

deflection 3 ft. 6 in.; maximum strain in wire 26,600 lbs. per sq. in. Sliding bow 7 ft. 3 in. long center to center of radial arms. The normal pressure of sliding bow may vary between 21 and 32 lbs.

Results Under Electrification in England.

The North-Eastern Railway, which has an electrified line from Newcastle to Tynemouth, carried during the last half-year 4,195,339 passengers, as against 3,548,206 in the same half of the previous year before electrification. The receipts from fares showed a corresponding increase, while working expenses decreased. At present experience of electric working has been so short that it is impossible to accurately calculate the depreciation chargeable, but it is hoped to be able to do so in a year or two.

The Timmis Bogie Lead.

The bogie or truck lead illustrated herewith was designed by Mr. I. A. Timmis,* of London, England, to do away with the nosing or hunting of a bogie truck caused by the fact that the center plate pushes it instead of pulling it. When a car is pulled at its leading end in the ordinary way it is free to turn on the center plates on which it rests. The trucks are thus swiveled at these points and are pushed by their center plates. Consequently, if the leading axle is driven, by any cause, to one side, the rear axle is apt to move in the opposite direction and hunting results.

In the Timmis arrangement the top center plate C (Fig. 1) is fitted to the body bolster in the usual manner and rests on an intermediate center plate C'; the swiveling is between these two plates. The plate C' is not, however, fastened to the truck bolster like the ordinary center plate but is smooth on the bottom and rests on the bolster plate A. The intermediate plate C' is free to move to a limited extent over the bottom plate longitudinally but cannot move laterally—all because of lugs that project downwards on each side and grasp the lower plate. The king bolt P fits easily in the holes through C and C', but the holes in A and the bolster are somewhat elongated, allowing the king bolt a slight longitudinal motion. The plate C' is also attached to the truck frame by the bars B and B', which end in slotted holes, allowing a limited longitudinal play. These tie the intermediate center plate to the truck. It is evident that, when the car body moves, both C and C' must move with it, and so must B and B', and the truck will be pushed at the leading end, regardless of the direction of the motion.

In another arrangement (Fig. 2) a roller is fastened at each end in the center line of the truck. Fitted to the car body underframe, close to each roller, is a quadrant, the face of which is struck from the center of the truck. It is made of hard steel and comes up against the roller. As the car body is pulled, the leading quadrant pushes the truck at its leading roller and the frame is thus pulled from the front instead of pushed from the center. A lead is thus given to the truck and it is claimed that all hunting is avoided. The roller has no play laterally because the side movement of the truck is restricted to its swing in passing curves, so there is but little wear on the quadrants and rollers. A roller in this position is needed to prevent wear, as the truck frame is constantly rising and falling.

This device is now in use on a number of roads in England and India, and it is claimed that it does away with much of the nosing. Two diagrams (Figs. 3 and 4) are presented herewith showing the horizontal motion of two cars running at the same speed, 42 miles per hour; one was fitted with the bogie lead and the other was not. In the case of the one with the bogie lead, the actual motion was about $^{3}/_{32}$ in. and in the other it was about $^{5}/_{16}$ in.

*Illius Augustus Timmis, M. Inst. C. E.; died Dec. 18, 1906.

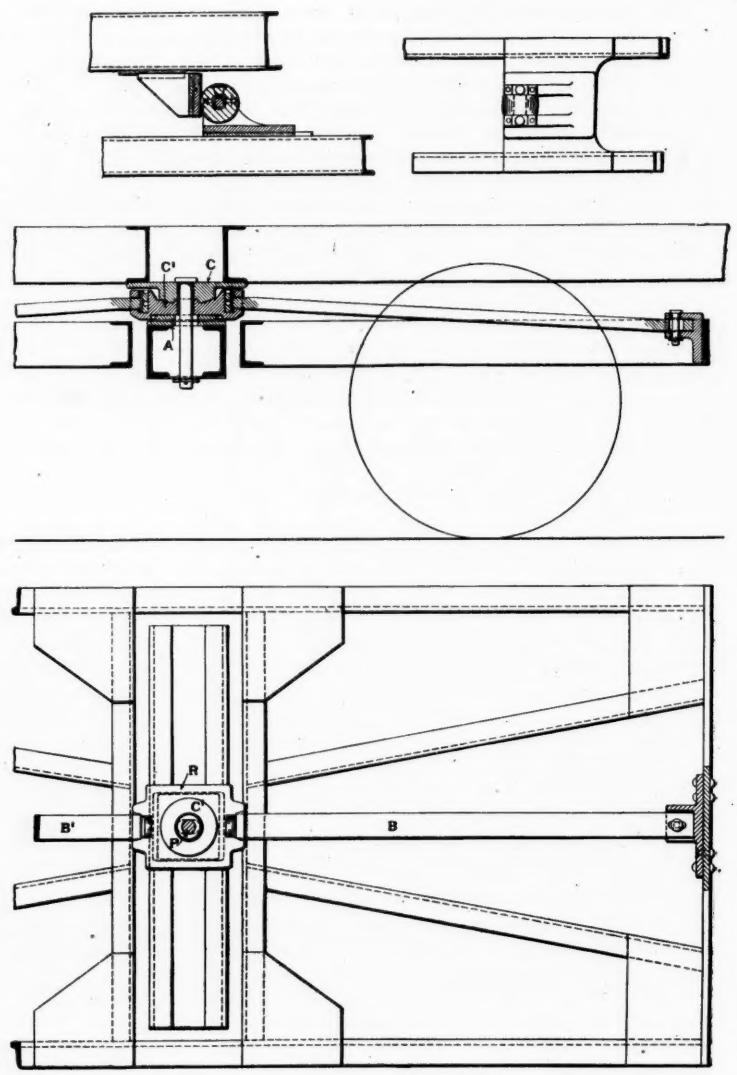


Fig. 1—Timmis Bogie Lead.

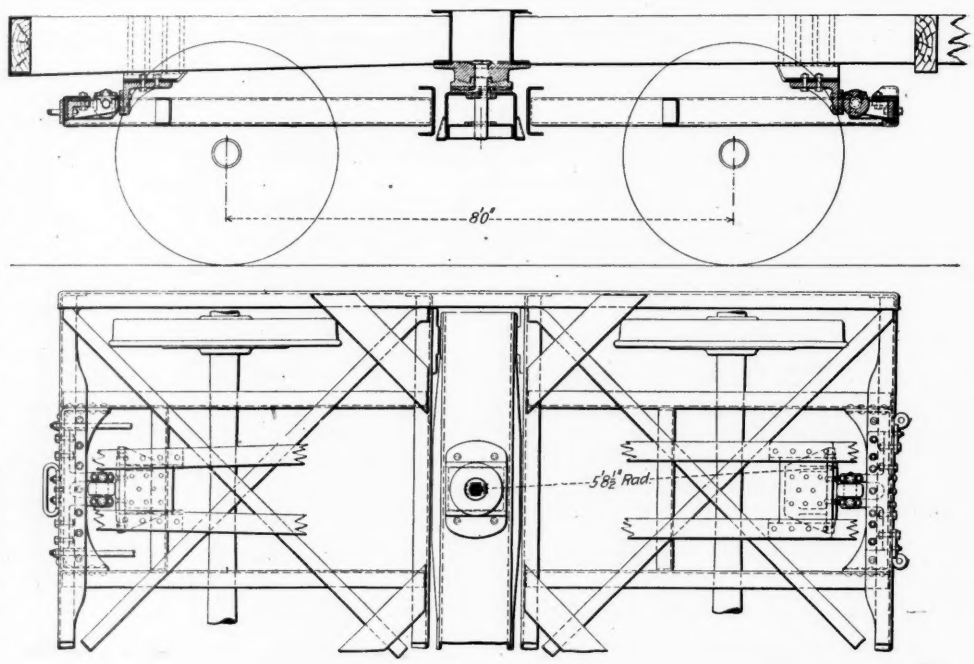


Fig. 2—Timmis Bogie Lead.

Fig. 3—Diagram Showing Horizontal Motion of Car Without Bogie Lead.

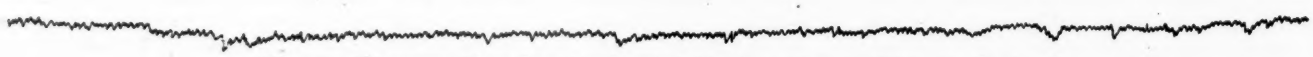


Fig. 4—Diagram Showing Horizontal Motion of Car With Bogie Lead.

Government Report on the Block System.

On Saturday last the Interstate Commerce Commission sent to Congress its report on block signal systems and automatic train stops, which has been prepared in obedience to resolution No. 46, passed by Congress last June. This report consists mainly of (1) a table showing the mileage of railroad block signaled in the United States in September last; (2) a general report on block signal practice in the United States, including a brief chapter on history, and (3) a discussion of the feasibility of using, in general railroad service, an automatic stop like that used in the New York City subway and on a few other city railroads. The report sent by the commission to Congress is based on one made to the commission by B. B. Adams, Associate Editor of the *Railroad Gazette*, and C. C. Anthony, Inspector of Signals of the Pennsylvania Railroad, and the commission has also sent to Congress a copious appendix to Messrs. Adams and Anthony's report embracing brief technical descriptions of the principal signals and appliances used on the railroads of the United States, and some accident statistics.

The first part of the report, dealing with history and with the present practice on the block signaled railroads of this country, is made up largely of matter with which the readers of the *Railroad Gazette* are already measurably familiar, and its publication will be deferred to a future issue. The mileage table is reproduced on another page of this issue.

Below are those parts of the report dealing with automatic stops and other appliances not in general use, and those containing the conclusions and recommendations of the commission.

AUTOMATIC STOPS.

Automatic stops are in use on the Boston Elevated Railroad and on the express tracks of the New York City subway. Neither of these lines is interstate, but the applications are of interest as illustrating the practical working of automatic stops, although their use on steam railroads would unquestionably be attended with many serious difficulties not met with under the special conditions of city rapid transit lines. The devices used are practically the same on both of the lines named. An arm or trip is placed alongside the rail and so arranged that it lies below the top of the rail when the signal is clear and is raised above the top of the rail when the signal indicates stop. The trip, like the signals, is operated electropneumatically. On the cars are valves in the brake-pipes having levers projecting downward so as to come in contact with the trips when the latter are raised. The striking of a valve lever against a trip opens the valve, allows the air to escape from the main brake-pipe and so, by the regular working of the automatic air-brake, causes the application of the brakes on all the cars and the stopping of the train.

Another automatic stop was used on the elevated railroad at the World's Fair, Chicago, and, for several years, on two of the elevated roads in Chicago; it was also tried to a limited extent on a few standard railroads. This device included a trip and an air valve in the brake-pipe, but the design was quite different from that mentioned in the preceding paragraph and was made with more particular reference to the conditions on standard steam railroads.

A system that may be regarded as a modification of the automatic stop, and which has been tried by a few railroads, uses an electric circuit completed through a contact device placed near the rail to actuate the mechanism which shuts off the steam on the locomotive and applies the brakes of the whole train. With this system, however, it is in the power of the engineman to open the throttle and release the brakes as soon as the device has operated, so that he can prevent the train from stopping or can regulate the speed so as to make the stop at any desired point. Thus the apparatus performs the function of calling to his duty an inattentive engineman, while yet not causing excessively sudden or unnecessary stops.

Automatic stops, except those of the class last mentioned, act independently of the engineman and bring the train to a stop before they can be released. They are therefore in the nature of emergency appliances, intended to stop a train before it reaches a point of danger if the engineman fails to do this himself. Obviously the automatic stop must act at such a distance from the actual point of danger that the train can be brought to a stop by the brakes before reaching that point. And if, in the ordinary course of operation, the engineman is to bring the train to a stop before the automatic device can come into action, the stopping point must be arbitrarily moved back, and the signal erected at the point where the trip or contact for the automatic stop is placed. Ordinarily, then the engineman will stop at a point (the "home" or stop signal in its new location) a safe stopping distance away from the place where the stop signal is usually located; but if, for any reason, he fails to do so, the train will still be automatically stopped short of the point beyond which it cannot safely run. The automatic stop that can be released at once by the engineman does not necessarily require any change in the location of the signals. The actuating device would naturally be placed at the distant signal (the signal set 100 or 200 rods back as a warning that the stop signal is being approached). In case the engineman should fail to do anything himself towards stopping the train, the automatic appliance would make the stop short of the home signal. But, if the engineman is in possession of his faculties and is attending to the running of the train when the distant signal is reached, he can prevent an emergency stop and bring his train up to the home signal exactly as he could if the automatic stop was not there. A disadvantage of this is that the stopping device does not guard against miscalculation or the result of unforeseen conditions that may make it impossible for the engineman to stop as he intends; it is fully effective only in case he is asleep or dead, or for any other reason fails to act when he passes the distant signal. But by the use of a proper recording device, used in connection with the stop, to check the action of the engineman, this disadvantage may be in a measure overcome.

It seems clear, then, that an automatic stop, to provide for all contingencies, should be absolute; and, in that case, as already pointed out, there must always be a section of "dead" track in the rear of every danger point, or, with automatic block signals, moving trains must be practically one block farther apart than they need be under present actual practice. This means a very decided reduction in the capacity of the road; that is, the number of trains that can be moved over it in a given time—a condition that in extreme cases would necessitate a costly increase of track facilities. It is this serious loss in capacity of the road, and, in addition, inconveniences that would result from stopping trains at a distance from the proper stopping points, with many practical difficulties in the application and operation of automatic stops, that has prevented any use, in ordinary railroad service, outside the experimental field, of an appliance so desirable theoretically.

It is undeniable that collisions on our railroads could be reduced to an exceedingly small number by the efficient management of block signals as now used, including well-known, well-tested and generally approved safeguards; it is also unquestionable that an efficient automatic stop would prevent that last small percentage of such accidents as are due to the engineman falling dead at his post and other like causes.

OTHER APPLIANCES.

A considerable number of inventions, embodying cab signals, automatic stops and combinations of the two, have been brought to the attention of the Commission. Most of these indicate on the part of their inventors an entire lack of familiarity either with the practical conditions of railroad operation or with the present state of the art of signaling. Many violate a universally accepted principle that, in the electrical control of signal appliances, the closing of the electric circuit should be necessary for the display of the clear signal, while the breaking of the circuit, intentional or accidental, should result in the stop indication of the signal. Many appear to have merit, but in the absence of actual continued use or even extended trial on any standard steam railroad no very definite opinion concerning their practicability can be formed.

SIGNALING ON ELECTRIC RAILWAYS.

On electric roads, other than standard steam roads on which electric traction has been installed, the development of block signaling has been on quite different lines from those followed in steam road practice. Station attendants are of course generally lacking, and, without them the means of cheaply operating a simple manual block system has not been available.

Interurban roads of moderate length and attaining moderately high speeds have at first been operated without signals of any kind; dependence has been placed upon the time-table for the meeting of cars on single track, and when this has failed, by reason of certain cars losing time, it seems to have been deemed reasonably safe, in view of the low speeds and generally good view, to leave it to the motorman and conductors to use their own judgment in making passing places. This way of operating has naturally, however, proved unsatisfactory and the next step has generally been to place electric lamp signals at the passing places and to operate these signals by electric switches thrown by the conductors or motormen. With these simple appliances it is possible for the men in charge of a car, on passing a siding, to signal the movement of their car to the next siding against a car moving in the opposite direction.

Electric lamps have been used very generally in signals for electric roads, for day as well as night indications, because of the ample supply of current to operate them and their simplicity as compared with signals having moving parts and requiring motors of some kind to move them. Lights, however, can hardly make as effective day signals for high-speed movements as do semaphores or even discs.

The track circuit has hardly been considered as a means for the automatic control of signals on electric roads of ordinary character, because of the special and expensive construction necessary to make the track circuit reliably operative in connection with the heavy current from the car motors which must also traverse the rails.

Automatic signal systems have been used on such roads to a

limited extent. These generally make use of contact devices touched or moved by the trolley. The brief electrical impulses given by these devices as the cars pass actuate the signal-setting and signal-clearing mechanism. To insure that the first car going out of a block shall not clear the signals when one or more following cars are still in the block, a counting device is used. This is set forward one point by each car entering the block and reversed a point by each car passing out; it therefore comes back to its normal position, permitting the signal to clear, only when as many cars have passed out of the block as have entered in succession. While counting devices may give quite satisfactory results on electric roads running single cars and having few irregular movements, it is plain that they would be practically useless under the complicated conditions imposed by freight traffic.

The automatic block systems for electric roads violate an important principle in that the stop signal indication is given by the closing of an electric circuit. The objection to this is somewhat lessened by the provision of a more or less positive indication to the motorman that the stop signal has been displayed; in the absence of such indication the motorman is required to proceed carefully through the block. But in this and other respects these systems fall below the standards of automatic signaling as generally recognized by signal engineers and all competent authorities on the subject.

CONCLUSIONS AND RECOMMENDATIONS.

Under questions 7, 8 and 9 in its order of August 24th, the commission sought to obtain information from railroad officials concerning the economy of the block system, the extent to which it had reduced the number or cost of collisions, and how far it had increased the capacity of their lines.

The answers to these questions have not been, in all respects, entirely satisfactory. Many railroad officials have freely expressed themselves in favor of the block system, and the manager of one of the most important systems of railroad in the country, on which automatic block signals of the latest type have been installed very extensively within the past few years, declares unequivocally that the investment which his company has made in this direction is one of the best that it has made in any department. A great many managers, however, appear reluctant to make positive statements with respect to the actual results attained from the operation of the block system on their lines.

It appears that the block system has been introduced from mixed motives. One road, for example, will incur the added expense of several hundred dollars per mile per year because it has been mulcted a considerable sum for damages in a collision of passenger trains; another will introduce the system because of numerous lesser collisions of freight trains, causing much loss and showing the likelihood of greater loss. Another will emphasize the feature of reputation, knowing that passengers will feel safer under a scientific system, and this feeling will influence their patronage. If a competing line already has block signals this argument may be forced on a manager. Another manager, particularly sensitive to the reputation of his road, will be influenced by the effect on his subordinates and on his own peace of mind. They all breathe more freely after getting rid of the anxieties incident to the time interval and flagging system.

The salient facts shown in the statements which have been received from carriers are that—

(1) Fifty of the principal railroads of the country have introduced and are using the block system on their important lines, though with considerable difference in details of apparatus and methods of operation.

(2) The telegraph block system is operated at moderate expense, with a great improvement in safety as compared with former methods of train control.

(3) Automatic block signals, almost universally looked upon in this country as the highest exemplification of the art, have been and are being developed with great energy and skill and liberal expenditures of money.

(4) Automatic signals are superseding the telegraph block system to some extent, and seem destined to do so increasingly in the future.

(5) Thirty roads of considerable length and importance have not yet adopted block signals of any kind.

(6) The block system has proved decidedly profitable even on lines where the signal equipment is not complete, this being accomplished by careful adherence to modifying rules making provisions against the deficiencies of the block system and by the continuance of the train despatching regulations which were used before the block system was adopted.

It is proper to add that all of the railroads continue in force their rule requiring that when a train is unexpectedly detained a flagman shall go back with a red flag or lantern to stop any following train; though, as the accident records show, flagmen have repeatedly failed to stop trains that have wrongfully passed block signals.

The main facts which have been elicited concerning the present policies of the railroads of the country in respect to block signaling are:

(1) The principal railroads use the block system on their lines of heaviest traffic, and most of them report that it is economical.

(2) Many of these roads use it also on lines of light traffic and some are rapidly extending it.

(3) All railroad officers deem the system an improvement over any other method of guarding against collisions. In other words, they consider it a means of safety.

(4) Many say that it has reduced the number and cost of collisions.

Those who do not testify on this last point simply plead ignorance, saying that their records are imperfect. One reason why some of the roads do not keep records of the results of the block signal system is, no doubt, that they are convinced that as a means of safety it is an improvement over the old system without statistical proof. Another is that its benefits consist partly in an amelioration of unfavorable conditions which cannot be definitely compared one period of time with another. It is probable that one reason why records are withheld on the plea of incompleteness or slight inaccuracies is that they show the prevalence of permissive blocking or other practices not generally approved.

The various conditions under which the different block signal methods are used may be observed by considering briefly the practice on typical roads as follows:

The controlled manual system is used on the four-track lines of the New York Central & Hudson River and the New York, New Haven & Hartford. These are the principal examples of this system in the United States. It is, of course, equally adapted to two-track lines. The electric train staff, which is a type of controlled manual apparatus, is used on 100 miles of a single-track division of the Southern Pacific and on short sections of other roads. The train staff is universally approved as a safety device, but its failure to secure more general recognition appears to be due to a general feeling that the controlled manual apparatus which is used on double-track lines is perfectly adapted to single-track work, and is superior to the staff in that trains need not be stopped or slackened for the purpose of delivering the staff.

The telegraph block system, the cheapest method in use, is found on four-track sections of the Pennsylvania Railroad (though according to the present policy of the road these signals will in the near future be supplanted by automatic signals); it is used on double-track lines by the Baltimore & Ohio, the Pennsylvania, the Chicago, Burlington & Quincy, the Chicago, Milwaukee & St. Paul, the Chicago & North-Western, the Erie, the New York Central Lines, the Philadelphia & Reading and a number of roads of less importance than these. The telegraph block system is used extensively on single-track lines of the Atchison, Topeka & Santa Fe, the Bessemer & Lake Erie, the Chesapeake & Ohio, the Chicago & Alton, the Chicago Great Western, the Lehigh Valley, the Norfolk & Western, the Northern Pacific, the Southern, the St. Louis & San Francisco, and on the lines just mentioned as using it on double track.

The automatic block system is in use on the four-track lines of the Boston & Albany, the Boston & Maine, the Central of New Jersey, the Pennsylvania, the Philadelphia & Reading and the Pittsburg & Lake Erie. It is in use on double-track lines of these roads and of the Baltimore & Ohio, the Chicago & Alton, the Chicago & Eastern Illinois, the Chicago & North-Western, the Delaware, Lackawanna & Western, the Illinois Central, the Lehigh Valley, the New York Central Lines, the New York, New Haven & Hartford, the New York, Ontario & Western, the Southern Pacific, the Union Pacific and on short sections of 14 other roads. It is used on single-track lines of the Chicago & Alton, the Cincinnati, New Orleans & Texas Pacific, the Delaware & Hudson, the Missouri Pacific, the Oregon Short Line, the Oregon Railroad & Navigation Co., the Southern Pacific and the Union Pacific, and on short sections of four other roads.

With regard to the telegraph block system, most of the roads using it show records of long continued immunity from collision, but the 13 collisions which are referred to in this report, details concerning which are given in the appendix, with others occurring more recently and still fresh in the public mind, compel us to recognize that the system is not perfect.

The only reason specifically formulated by any railroad manager for not introducing the block system is financial inability, except in the case of lines on which the passenger business is extremely light. Looking at the policies of some roads as they are known and at others in the only way in which they can be interpreted in the light of facts, it is quite clear that, generally speaking, the roads which have been dilatory in adopting the block system or in extending its use have simply pursued that temporizing policy which postpones appropriation of money until necessity will permit of no further postponement. An appropriation for the erection of block signals or for the expense of maintaining them is not viewed with favor because railroads operating without such signals have, in many cases, made fair records for a long time. It is true that important railroads have carried thousands of passengers for many

years, with no block system, without fatally injuring a single one of them in a collision. Such a record is justly regarded with pride; but a single collision ten years hence, which is an admitted possibility, would extinguish the pride and becloud the record of the past.

Many important roads have introduced the telegraph block system with the expenditure of very little money, simply by establishing a few new telegraph offices. There are also cases where a road, which has apparently held the view that the block system is impracticable by reason of its cost, has quickly changed its policy after the occurrence of a collision on its own line. It is true that roads which introduce the block system without increasing their telegraph facilities usually find themselves obliged, for a part of the time at least, to run freight trains under permissive blocking (which, strictly speaking, is not block signaling at all), but the action of such roads is significant because it marks decided progress. Their imperfect system protects passenger trains and it educates trainmen to the need of a space interval for all trains.

A number of prominent roads which have shown enterprise in safeguarding their more important lines by means of block signals are continuing the old methods on other lines. A disastrous collision in the state of Indiana in November affords a striking illustration of this fact. A few roads which enjoy ample prosperity have as yet done little or nothing in providing block signals.

The present investigation has been conducted for the purpose of setting forth the actual facts under present practices, and of affording the best guide as to what can or should be done to improve the safety of travel on the railroads of the United States. The conclusions reached confirm the views which have been heretofore expressed by the commission in its annual reports for the years 1903, 1904 and 1905. In its report for the year 1903 the commission presented the draft of a bill similar to the one introduced in the House by the Hon. John J. Esch, of Wisconsin, which provides for the introduction of the block signal system and also for the exercise of supervisory power by the commission through the employment of suitable agents and inspectors.

Supervision is necessary, not only to insure that the specific requirements of the law are complied with, but also because of differences in methods of construction and operation and in the standards of perfection and safety on different roads where the block signal system is already in use. This point was not especially emphasized by the commission at the time the bill was laid before Congress, but the present investigation has more clearly emphasized the need of such supervision. The differences of practice, etc., are reflected in the results of operation. In reporting the faults of signals and errors in operation, different companies make widely different showings. This is a vital matter in which the function of the government in securing publicity is a particularly useful one, and in which no authority other than the government can act efficiently. To investigate accidents, as is done in England and to some extent by state commissions in this country, may be called an indirect method of securing information as to the efficiency with which safeguards to life and property are administered. To investigate signals and signal practice directly, without regard to accidents, would be a more direct method of promoting safety. Accidents should be investigated, for they increase so rapidly year after year that the record is looked upon as a reproach upon our American system of railroad management; but it is even more logical and reasonable to investigate signal practice, for, as regards the worst class of accidents, namely, collisions, investigation and regulation which look to prevention are chiefly of value. Investigation to this end is needed under four heads, namely:

(1) The telegraph block system on the larger roads (mainly double track) as regards the personnel and the routine; the use or non-use of distant signals, and the practice of permissive block signaling.

(2) The telegraph block system on single-track lines and minor roads, as regards the personnel, the routine, distant signals and permissive signaling, and also as regards the use of time rules and despatchers' orders to make up for incompleteness in the block signaling arrangements.

(3) The automatic block system should be investigated on all roads with respect to the efficiency of the apparatus and of the methods of inspection and care, and the integrity of the records of signal operations in respect to their completeness.

(4) The automatic block system on single-track lines should be investigated with respect to the features named in the foregoing paragraph, and also as regards the use simultaneously with the block signals of despatchers' orders and other measures designed to prevent collisions irrespective of the block signal system.

If legislative enactment should not require the early introduction of the block system on all railroads, government inquiry should be pursued with a view to determine the necessity for its installation on particular lines or parts of lines on which it is not now in use. The principal and, indeed, the only argument against the enactment of a compulsory block signal law is that a large number of railroads are now making fair progress in the extension of block signals without compulsion. Certainly the roads which come within this class can have no fault to find with such a mild measure of compulsion as that provided for in the bill proposed by the commission; while as to roads which have taken no action, some compulsion should be employed to require them to bring their service up to a proper standard within a reasonable time.

The question of the need of apparatus for automatic control of trains is a somewhat difficult one. Collisions occur occasionally under both the telegraph and automatic block systems, which an efficient automatic stopping apparatus might prevent. The locomotive engineman has most exacting duties. An individual runner may be far above the average in mental poise and moral character and yet may fail in vigilance or in judgment occasionally, and such failure may mean disaster. Again, the individual engineman may be efficient in a high degree, and yet the efficiency of a force of enginemen as a whole may be unsatisfactory. The engineer performs such an innumerable succession of important acts on every trip that, even with an infinitesimal percentage of failures, the 40,000 or 50,000 engineers of the United States may still be chargeable in the course of a year with a large aggregate of fatal and non-fatal injuries. Anything less than perfection is cause, at least, for investigation, if not for decided dissatisfaction. Every great accident due to an engineman's fault is followed by a strong public demand for the introduction of automatic train stopping devices. As previously shown in this report, such devices used to a limited extent, though not on interstate roads, seem to have given a fairly good account of themselves; but these records do not justify the commission in making any recommendation as to their use or non-use without a more thorough and complete investigation.

The limited extent to which devices of this character have been used makes it practically impossible for the commission to obtain anything more than theoretical and technical knowledge concerning them. It is therefore apparent to the commission that Congress cannot be furnished with much further information concerning these appliances, which would appear [to be] extremely valuable, theoretically, without extensive tests conducted by officials of the government and at government expense. For this reason and because the resolution under which this inquiry has been made does not confer authority to make such tests, the commission, on January 3, 1907, addressed a communication to Congress recommending that supplemental legislation be enacted authorizing the commission or some other official body to supervise and conduct experimental tests of such safety devices as appear to be meritorious, and that an appropriation be made sufficient to secure the most competent experts and defray the other expenses incident to such a project. The commission can only repeat this recommendation, believing that such experimental tests would be of great value in determining the direction which legislation not now recommended should take in seeking to add to the safety of railroad operations.

The recommendations of the commission for immediate or early legislation are summarized as follows:

(1) That the use of the block system should be enforced on the passenger lines of the country in general according to the provisions of a bill in substance like the one submitted to the Congress by the commission in December, 1903,* . . . except that the time to be allowed for final compliance with its compulsory features should be made three or four years from the present.

(2) That with or without the passage of a law requiring the use of block signals, there should be a law authorizing an official investigation of train accidents, and providing for the employment of competent men to perform the duties imposed by such an enactment.

(3) That investigation by official tests of automatic appliances for the control of railroad trains should be authorized in accordance with the commission's recommendation of January 3, 1907, with an appropriation of sufficient amount to conduct such tests in a proper manner.

Recently a disastrous collision occurred in the District of Columbia (at Terra Cotta station on the Baltimore & Ohio Railroad, December 30, 1906), in which over 30 passengers and other persons were killed. This collision occurred on a line equipped with block signals. It was the subject of much discussion in the press and elsewhere, and the circumstances attending it were such that the whole question of the management of railroad trains when running at high speed was brought prominently before the public, including the comparison of the block system of signals with other methods. The commission therefore instituted an inquiry into the case, as well as into another collision which occurred in November on the Southern Railway, causing the death of Mr. Samuel Spencer, the President of that railroad. These inquiries are not yet completed, but these accidents are referred to here simply for the purpose of observing that consideration of them has not been omitted. The investigations have proceeded far enough to show that the fault in these cases is not to be charged to the signal system in use, but to laxity in the methods of operating it. Collisions from the same or similar causes have occurred many times before, and these causes

*_Railroad Gazette_, Jan. 1, 1904, page 14.

have had full consideration in the present report. As has been observed in the annual reports of the commission to Congress, the block signal system remains superior to any other system, both theoretically and by the test of actual experience, after all due weight has been given to the records of failures in the running of trains under it. It is the intention of the commission to submit a further report covering these matters, and other questions that have not been fully treated herein.

Answering specifically the questions (not hereinbefore answered) which are embodied in the Senate resolution of January 29, 1907:

The length of time that would be required to put in operation the telegraph block system would depend on the facility with which telegraph operators could be trained to act as signalmen, and, in most cases, on the ability of manufacturers (railroad shops or independent concerns) to provide and erect the signals and apparatus. As these questions have to be decided in each case, on the special conditions of that case, a general answer could not be made; but a period of from one to three years would undoubtedly be fair. For the installation of automatic signals a longer time should be allowed (in the present state of manufacturing business, with all shops over-worked, a much longer time, because the apparatus is delicate and costly, requiring time and extensive facilities for manufacture). The commission has not recommended the specific requirement by law of any particular kind of signals, and it is not believed that the introduction of automatic signals should be made compulsory at the present time. * * *

Mileage of Railroad Worked by the Block System.*

The length of railroad lines in the United States on which trains are run under the block system, as shown by reports made in September, 1906, in response to the order of the Commission, is 48,743.2 miles. The items making up this total are shown in the table which appears herewith. A length of 6,826.9 miles is shown as being equipped with automatic block signals, and a length of 41,916.3 miles as worked by manual signals; and these are further subdivided into single-track lines, double-track, etc. Of the lines worked manually, 911.8 miles, on seven different roads, are equipped with controlled manual apparatus; that is to say, the signal levers have electric locks providing interlocked control from station to station. This electrically controlled apparatus is substantially all to be found on double-track lines. A less complete "control" apparatus is in use on 915.7 miles of single-track lines, belonging to four companies. Another method of electrical control, the electric train staff, adapted for the protection of trains on single-track lines, is in use on 179.3 miles of road, belonging to 13 different companies.

A number of important companies have made considerable extensions to their block-signaled lines during the year 1906. Comparing the totals now reported with those appearing in a table published by the *Railroad Gazette* in January, 1906, the following increases appear:

Roads.	Miles.	Roads.	Miles.
Atlantic Coast Line	152	Michigan Central	630
Central of New Jersey	97	Mobile & Ohio	24
Chesapeake & Ohio	135	N. Y. Central & Hudson River.	279
Cleveland, Cincinnati, Chicago & St. Louis	205	Norfolk & Western	490
Delaware & Hudson	101	Oregon R. R. & Navigation Co.	77
Del., Lack. & Western	38	Philadelphia & Reading	19
Erie	72	Pennsylvania (including controlled lines west of Pittsburg)	468
Great Northern	176	Southern Railway	101
Hocking Valley	31	Southern Pacific and controlled lines	374
Illinois Central	146	St. Louis & San Francisco	38
Lake Shore & Mich. Southern.	1,137	Union Pacific	88
Lehigh Valley	46		
Long Island	13		
Louisville & Nashville	374		

In a number of cases the mileage now reported is less than that which appears in the *Railroad Gazette's* table of a year ago. * * * Some of these discrepancies are accounted for by the fact that in the Commission's statistics subsidiary companies are shown separately; others appear to have been due to incorrect reports made by the railroad companies to the *Railroad Gazette*. In two or three cases railroads then reported that on all of their lines, not completely block signaled, passenger trains were protected according to the space-interval principle, by supervision from the train despatchers' offices, and this mileage, suitably explained, was included in the *Gazette's* table; but these roads did not make any such claim in the reports which they sent to the Commission.

It will be seen that nearly all of what are called the great railroads of the country are represented in the table, showing that on the broad question of the merit and adaptability of the block

*From report made to Congress by the Interstate Commerce Commission.

Block Signals on the Railroads of the United States.

Table showing, for each company, the aggregate length of its lines or parts of lines on which the Block System is in use; September, 1906. Companies not appearing in the list have reported that no block signals are in use on their lines.

Names of railroads.	Automatic block signals. Track: Single.	Double.	Three.	Four.	Total, auto.	Non-automatic signals.[1] Track: Single.	Double.	Three.	Four.	Total, non-auto.	Total all kinds.	Total miles operated.*	Per cent. operatd undr blk system
Alabama Great Southern	29.5	..	..	..	29.5	2.0	..	..	..	2.0	31.5	291.1	11.0
Ann Arbor	..	..	..	..	..	1.4	..	..	..	1.4	1.4	292.0	..
Atchison, Topeka & Santa Fe	—	18.2	—	—	18.2	965.6	227.0	—	—	—	—	—	—
	..	..	..	..	..	s 18.8	..	..	..	1,211.4	1,229.6	5,043.0	23.3
Atlanta & West Point	..	..	..	..	..	..	4.8	..	..	4.8	4.8	87.0	5.5
Atlantic City—included in Phila. & Reading.	..	..	..	..	..	..	..	..	..	..	..	..	..
Atlantic Coast Line.[2]	—	—	—	—	—	431.7	64.5	—	—	496.2	496.2	3,981.8	12.5
Baltimore & Ohio	..	102.4	..	..	102.4	308.4	373.5	3.0	8.5	693.4	795.8	2,960.7	26.8
Cleveland, Lorain & Wheeling	..	..	..	..	..	12.0	2.8	..	..	14.8	14.8	135.0	11.0
Baltimore & Ohio Southwestern	—	..	..	..	—	—	24.0	—	3.0	27.0	27.0	981.0	2.4
Baltimore & Sparrow's Point	..	..	..	..	..	..	3.2	..	..	3.2	3.2	4.9	65.3
Bessemer & Lake Erie	..	..	..	..	..	135.3	61.2	..	..	196.5	196.5	198.7	98.9
Boston & Albany	—	164.7	—	16.0	180.7	—	—	—	—	—	180.7	377.5	48.0
Boston & Maine	..	62.0	0.5	2.1	64.6	..	108.0	..	..	..	..	..	..
	..	..	..	..	..	..	c 4.8	..	..	112.8	177.4	2,238.6	8.0
Buffalo, Rochester & Pittsburg.[3]	..	..	..	..	..	322.6	106.9	..	..	429.5	429.5	429.5	100.0
Central of Georgia	—	—	—	—	—	52.6	10.0	—	—	62.6	62.6	1,853.0	3.3
Central of New Jersey	..	258.6	..	32.8	291.4	..	..	..	..	..	291.4	584.0	50.0
Chesapeake & Ohio	..	..	..	..	..	890.9	237.6	..	..	..	..	..	..
	..	..	..	..	..	..	c 116.2	..	..	..	..	..	..
	..	..	..	..	..	s 9.2	..	..	..	1,303.9	1,303.9	1,549.1	84.2
Chicago & Alton	159.9	103.5	—	—	263.4	s 14.1	—	—	—	—	—	—	—
	..	..	..	..	..	341.2	41.2	..	..	396.5	659.9	937.0	70.0
Chicago, Burlington & Quincy	..	20.3	..	7.1	27.4	777.5	448.0	17.1	..	..	..	..	..
	..	..	..	..	..	s 1.3	..	..	..	1,243.9	1,271.3	8,876.7	93.6
Chicago, Burlington & Quincy (see notes)	..	..	..	..	..	2,932.5[4]	..	..	..	..	..		
	..	..	..	..	..	4,107.1[5]	..	..	..	7,039.6	7,039.6		
Chicago & Eastern Illinois	2.0	101.6	—	—	103.6	c 135.7	—	—	—	135.7	239.3	793.3	30.0
Chicago Great Western	..	4.8	..	..	4.8	288.7	7.9	..	..	296.6	301.4	714.2	42.0
Chicago, Indiana & Southern	..	2.0	..	..	2.0	21.5	..	..	..	21.5	23.5	328.0	7.2
Chicago, Milwaukee & St. Paul	..	32.2	..	..	32.2	s 7.5	..	..	..	..	..	..	..
	—	—	—	—	..	c 1.0	—	—	—	—	—	—	—
	..	..	..	..	..	2,157.0	355.7	..	..	2,521.2	2,553.4	7,180.0	35.6
Chicago & North-Western	..	404.7	8.5	6.0	419.2	2,871.2	378.6	..	..	3,249.8	3,669.0	7,479.7	49.0
Chicago Terminal Transfer	..	3.0	..	..	3.0	..	..	..	..	..	3.0	37.0	8.1
Chicago, Rock Island & Pacific	—	9.3	—	—	9.3	s 4.7	69.5	—	—	74.2	83.5	6,490.0	1.3
Chicago & Western Indiana	..	7.5	..	..	7.5	..	c 19.8	..	..	19.8	27.3	27.3	100.0
Chicago, St. Paul, Minneapolis & Omaha	1.2	..	..	..	1.2	629.0	29.9	..	..	658.9	660.1	1,655.8	40.0

(*Table continued on next page.*)

*For passenger traffic.

[1] All items under non-automatic represent the telegraph block system, unless otherwise indicated by "c," meaning controlled manual, or "s," meaning electric train staff.

[2] On all but 26 miles the block signals protect from rear, but not from butting, collisions.

[3] Buffalo, Rochester & Pittsburg: Block signals used only for protection of rear of passenger trains and snow plows.

[4] C., B. & Q.: 2,932.5 miles for protection of passenger trains only.

[5] C., B. & Q.: 4,107.1 miles for protection of passenger trains, but not throughout the 24 hours of the day.

[6] More than four tracks.

[7] Lehigh Valley: Block signals on 72.3 miles not used by passenger trains (29.3 miles double track and 43.0 miles single track).

[8] All freight.

[9] Excluding lines on which but one train is run.

[10] Pennsylvania R. R.: Item 191.5 miles includes 1.8 miles of line having more than four tracks; Item 192.8 miles includes 1 mile of line having more than four tracks.

[11] Including Atlantic City R. R.; North East Pennsylvania R. R.; Perkiomen R. R.; Philadelphia, Newtown & New York Ry.; Reading & Columbia R.R.

[12] Excluding 391 miles on which only one train crew is in service.

[13] St. Louis Merchants' Bridge Terminal: Block signals on 1.2 miles of freight lines.

[14] Caution signals.

[15] Four-track and six track.

[16] Wabash R. R.: Item 1,965.9 miles includes 763 miles of line on which block signals are used only for protection of rear of passenger trains.

[17] The items representing lines on which the use of the block system is partial (Buffalo, Rochester & Pittsburg; Chicago, Burlington & Quincy; Wabash) aggregate 8,232.1 miles.

BLOCK SIGNALS ON THE RAILROADS OF THE UNITED STATES.—(*Continued.*)

Names of railroads.	Automatic block signals. Track: Single.	Double.	Three.	Four.	Total, auto.	Non-automatic signals.[1] Track: Single.	Double.	Three.	Four.	Total, non-auto.	Total all kinds.	Total miles operated.[2]	Per cent. operatd undr b k system
Cincinnati, Hamilton & Dayton	—	—	—	—	—	76.0	25.0	—	—	101.0	101.0	1,038.2	10.0
Cincinnati, New Orleans & Texas Pacific	...	...	..	..	...	c 5.9	..	..	..	...	...	...	...
	303.2	16.4	..	..	319.6	s 5.5	..	..	..	11.4	331.0	335.0	99.0
Cleveland, Cincinnati, Chicago & St. Louis	..	..	..	..	..	795.7	263.0	..	..	1,058.7	1,058.7	1,887.1	56.0
Cumberland Valley	—	—	—	—	—	22.3	—	—	—	22.3	22.3	163.2	13.7
Delaware & Hudson	123.0	86.0	1.5	8.5	219.0	..	..	..	..	..	219.0	820.9	27.0
Delaware, Lackawanna & Western	3.0	428.0	..	4.1	435.1	..	..	..	..	..	435.1	927.6	47.0
Erie	—	—	—	—	—	768.4	665.8	—	—	—	—	—	—
	—	—	—	6.8	6.8	—	c 14.3	—	c 24.0	1,472.5	1,479.3	2,381.1	62.1
Galveston, Harrisburg & San Antonio	7.0	..	..	..	7.0	s 2.0	..	..	..	2.0	9.0	1,329.7	..
Great Northern	..	..	..	..	..	s 3.5	..	..	..	...	...	...	...
	..	..	..	..	..	172.5	..	..	..	176.0	176.0	5,230.8	3.4
Hocking Valley	—	—	—	—	—	76.9	—	—	—	76.9	76.9	338.5	22.7
Illinois Central	5.4	227.5	..	5.2	..	c 758.7	..	..	..	..	..	..	..
	..	..	..	..	...	5.1	..	..	..	...	...	...	...
	..	..	..	8.4[6]	246.5	..	..	..	..	763.8	1,010.3	4,459.1	22.7
Kentucky & Indiana Bridge & R. R. Co.	..	..	..	..	..	8.0	2.1	..	..	10.1	10.1	10.1	100.0
Lackawanna & Wyoming Valley	—	—	—	—	—	s 2.2	1.2	—	—	3.4	3.4	23.0	15.0
Lake Erie & Western	..	..	..	..	..	18.6	..	..	..	18.6	18.6	686.0	2.7
Lake Shore & Michigan Southern	..	131.5	46.5	118.9	296.9	1,134.4	222.2	18.9	5.2	1,380.7	1,677.6	1,677.6	100.0
Lehigh Valley	31.3	401.8	36.1	—	469.2	690.0	54.2	—	—	—	—	—	—
	..	..	..	..	..	s 6.2	..	..	..	750.4	1,219.6	1,147.3	100.0[7]
Long Island	2.6	62.2	..	..	64.8	..	c 14.1	..	c 1.2	15.3	..	..	..
	..	..	..	..	..	..	15.1	..	2.7	17.8	97.9	392.0	22.0
Louisville & Nashville	..	..	..	..	..	342.7	31.1	..	..	373.8	373.8	4,011.0	9.3
Maine Central	13.1	—	—	—	13.1	—	—	—	—	—	13.1	807.5	1.6
Michigan Central	..	272.0	..	..	272.0	938.7	..	..	..	938.7	1,210.7	1,309.9	92.4
Missouri Pacific	42.5	17.2	..	..	59.7	..	..	..	..	..	59.7	3,492.5	1.7
St. Louis, Iron Mountain & Southern	28.8	5.7	—	—	34.5	—	—	—	—	—	34.5	2,459.1	1.4
Mobile & Ohio	..	2.3	..	..	2.3	50.7	..	..	..	50.7	53.0	926.0	5.7
Morgan's Louisiana & Texas	...	..	..	..	...	..	..	..	..	..	...	...	...
Louisiana Western	123.0	—	—	—	123.0	—	—	—	—	—	123.0	552.6	22.3
Iberia & Vermillion	..	..	..	..	..	...	...	..	..	...	...	...	...
Nashville, Chattanooga & St. Louis	..	..	..	..	..	94.2	8.6	..	..	102.8	102.8	1,226.0	8.5
Newburgh & South Shore	—	—	—	—	—	3.0	2.0	—	—	5.0	5.0	—[8]	—
New York Central & Hudson River	..	112.2	..	7.1	119.3	1,814.3	356.0	..	..	...	...	...	...
	..	..	..	..	..	c 1.2	c 153.3	..	c 281.4	2,606.2	2,725.5	2,941.2	92.5
St. Lawrence & Adirondack	...	...	..	..	...	10.2	..	..	..	10.2	10.2	10.2	100.0
New York, New Haven & Hartford	27.0	199.2	—	—	226.2	159.9	53.8	—	—	—	—	—	—
	13.7	74.7	..	..	...	..	c 156.1	..	c 70.6	440.0	666.6	1,900.0	35.0
New York, Ontario & Western	..	..	..	..	88.4	..	..	..	..	..	88.4	492.8	17.5
New York, Susquehanna & Western	..	..	..	..	..	..	19.6	..	..	19.6	19.6	205.0	1.0
New York & Long Branch	—	38.0	—	—	38.0	—	—	—	—	—	38.0	38.0	100.0
Norfolk & Western	..	..	..	..	..	1,446.0	218.0	..	..	1,664.0	1,664.0	1,825.0	92.0
Northern Central	..	..	..	..	...	290.9	127.8	..	17.4	436.1	436.1	437.1	99.7
Northern Pacific	—	14.8	—	—	14.8	961.7	98.1	—	—	1,059.8	1,074.6	5,352.4	20.0
North Shore	..	10.0	..	..	10.0	..	..	..	..	..	10.0	95.0	10.0
Oregon Short Line	35.9	..	..	..	35.9	..	..	..	..	..	35.9	1,092.8	3.3
Oregon R. R. & Navigation Co.	188.0	—	—	—	188.0	—	—	—	—	—	188.0	828.0[9]	22.7
Pennsylvania Railroad.[10]	..	49.5	..	191.5	241.0	531.5	652.0	23.3	192.8	1,399.6	1,640.6	3,191.5	51.4
Pennsylvania Company	23.0	5.0	11.0	18.0	57.0	232.0	616.0	20.0	25.0	893.0	950.0	1,334.0	71.3
Pittsburg, Cincinnati, Chicago & St. Louis	—	5.0	—	2.0	7.0	526.0	435.0	7.0	—	968.0	975.0	1,393.0	70.0
Peoria & Eastern	..	..	..	..	..	..	5.2	..	..	5.2	5.2	342.6	1.5
Peoria & Pekin Union	...	...	...	...	...	...	7.5	..	..	7.5	7.5	15.4	48.7
Philadelphia & Reading.[11]	13.7	352.6	35.0	11.7	413.0	206.6	139.8	..	..	..	..	..	..
	—	—	—	—	—	c 0.8	—	—	—	—	—	—	—
	..	..	..	..	..	s 3.6	..	..	..	350.8	763.8	1,166.9	65.5
Philadelphia, Baltimore & Washington	..	11.0	20.4	..	31.4	..	124.6	..	40.5	165.1	196.5	657.1	30.0
Pittsburg & Lake Erie	..	105.8	8.7	26.3	140.8	27.0	..	..	..	27.0	167.8	167.8	100.0
Richmond, Fredericksburg & Potomac	—	—	—	—	—	9.8	77.9	—	—	87.7	87.7	87.7	100.0
Seaboard Air Line	..	..	..	..	..	155.0	..	..	..	155.0	155.0	2,330.0	6.6
Southern	..	..	..	..	..	1,062.7	77.8	..	..	1,140.5	1,140.5	6,397.5[12]	18.0
Southern Pacific: Pacific System	—	—	—	—	—	20.0	—	—	—	—	—	—	—
	369.4	50.3	..	..	419.7	s 97.0	..	..	..	117.0	536.7	4,330.0	12.4
East of Sparks	216.1	..	..	..	216.1	..	..	..	..	..	216.1	1,006.7	21.5
Lines in Oregon	..	..	..	..	..	..	..	..	..	..	..	..	..
St. Louis Merchants' Bridge Terminal	—	8.5	—	—	8.5	—	1.1	—	—	1.1	9.6	8.4	100.[13]
St. Louis & San Francisco	5.0	3.0	..	..	8.0	346.0	27.0	..	..	..	..	..	..
	..	..	..	..	..	s 3.7	..	..	..	..	..	..	..
	..	..	..	..	..	c 2.0	..	..	..	378.7	386.7	4,055.9	9.5
Staten Island Rapid Transit	..	9.2	..	..	9.2	..	..	..	..	..	9.2	9.2	100.0
Terminal R. R. Association of St. Louis	—	6.1	—	—	—	—	c 1.0	—	—	—	—	—	—
	..	1.2[14]	..	..	7.3	..	0.6	0.6	1.3[15]	3.5	10.8	11.2	97.0
Texas & New Orleans	41.0	..	..	..	41.0	..	..	..	..	..	41.0	438.6	9.0
Union (Pittsburg)	..	1.0	..	..	1.0	3.2	1.8	..	..	5.0	6.0	..	..
Union Pacific: East of Green River	104.7	45.1	—	—	149.8	—	—	—	—	—	149.8	2,751.9	5.5
West of Green River	115.2	..	..	..	115.2	..	..	..	..	..	115.2	203.6	56.6
Vandalia	..	..	..	..	..	219.6	18.9	..	..	238.5	238.5	804.9	29.6
Wabash.[16]	—	7.2	—	—	7.2	1,965.9	71.6	—	—	2,037.5	2,044.7	2,044.7	—
Wabash-Pittsburg Terminal	..	4.8	..	..	4.8	..	..	..	..	..	4.8	59.9	8.0
Washington Southern	..	..	..	..	..	3.6	28.9	..	..	32.5	32.5	32.5	100.0
West Jersey & Sea Shore	—	84.3	9.9	—	94.2	47.8	28.4	—	—	76.2	170.4	321.6	53.0
Wisconsin Central	..	..	..	..	..	..	6.1	..	..	6.1	6.1	838.8	..
Yazoo & Mississippi Valley	4.2	..	..	..	4.2	c 15.4	..	..	..	15.4	19.6	1,239.1	1.6
Total[17]	2,032.4	4,143.9	178.1	472.5	6,826.9	33,585.1	7,567.7	89.9	673.6	41,916.3	48,743.2	143,615.8	.....

system the views of the officers of these roads are in substantial agreement. With two or three exceptions, all companies doing what may be called a heavy passenger business are represented here. On 29 roads which have no block signals (all but five of them operating, each, less than 500 miles of line) the passenger traffic is comparatively light. Only two of these reported for the year ending June 30, 1905, passenger earnings of over $2,500 per mile.

Final Report of the Pennsylvania Railroad Special Investigating Committee.

II.

In regard to bituminous coal car distribution on the Eastern lines, the committee reports as follows:

On January 1, 1900, there were in operation 272 bituminous coal mines. On January 1, 1906, that number had increased to 504, of which 97 were new operations not controlled by companies theretofore operating. In 1900 there were moved 25,944,018 tons, of which 20,183,802 tons originated on the line and 5,760,216 tons originated on other lines. In 1906 there were moved, in 39,882 Pennsylvania cars, and in 21,042 individual cars, and in a large and unascertained number of foreign cars, 35,701,742 tons, of which 32,398,081 tons originated on the line, and 3,303,881 tons originated on other lines. These figures for both years include all company coal bought for leased, or operated lines, and, therefore, paying freight revenue, but do not include the coal bought by the Pennsylvania Railroad for its own use, which does not pay freight revenue. The general traffic of the road also, as has been stated, increases year by year. There are, therefore, year by year, more tons of bituminous coal to be moved to market over lines which are more and more congested by a growing traffic. In 1906 the movement of coal represented 52 per cent. of the total tonnage. Notwithstanding the heavy expenditure made for new equipment, the number of cars available for that movement does not keep pace with the demand, because of the detention of cars on other lines, because of the necessity of providing more cars for general traffic, and because of the increased number of cars required to move the coal for the greater number of engines which the growing traffic of the road makes necessary. Some system of pro rata car distribution is, therefore, necessary. The basis of any such system is the determination of the shipping capacity, or rating, of each mine. Prior to January 1, 1906, this determination was made by the superintendent, within whose jurisdiction the mine is situated, with the approval of the general superintendent, and was based upon the superintendent's finding as to the maximum output of the mine during a given period. If a shipper complained that the rating of his mine was too low when made, or that it should

be increased by reason of facilities subsequently added, a test was was made by furnishing, without previous notice, an ample supply of cars to that mine for a limited number of days, and report was then made as to the number of cars actually loaded for movement. That system was open to the objection that it operated in favor of the more persistent and clamorous of the shippers, and, so far as regarded the testing for pro rating, that, unless that testing was continued for a considerable period, it was liable to be affected by accidental and temporary causes, such as a lack of miners, or a breakdown of machinery, etc. Therefore, after careful consideration and inquiry, on January 1, 1906, a system was adopted of fixing the rating of each mine by a determination of its probable shipping capacity; the possible physical capacity of each mine in tons being first ascertained by mining engineers appointed by the railroad, those engineers taking into consideration in each case the thickness of the veins, the number of openings, the extent of the workings, the capacity of the tipples, the facilities for putting coal on the cars, the average tonnage mined per man, assuming a full supply of labor, and all other conditions affecting the physical capacity of the mine. Then, in order that a mine opened and worked to supply a constant commercial demand might receive greater consideration than one which was only worked in periods of high prices, and for purposes of speculative profits, the tons actually shipped by the mine during the year preceding were reported by the railroad's Auditor of Coal Freight Receipts. The figures from these two sources were then added together and divided by two, and the result taken as the maximum rating of the mine in tons, or, when divided by 35, in cars of 35 tons capacity. The uncontradicted testimony taken before the Interstate Commerce Commission shows that as a preliminary to the determination of the physical capacity of the mines, a circular was issued in June, 1905, and sent to every bituminous coal operator, requesting information as to his coal acreage, the number of openings, the number of miners employed, the capacity of his mines, wagons, tipples and sidings, the average number of miners working per month during the year preceding, etc. To those who did not reply promptly a second circular was issued, requesting a reply. A large number of the operators did not reply to either circular.

On February 1, 1906, and, therefore, before the Interstate Commerce Commission began its investigation into this subject, another circular was issued and sent to every bituminous mine operator, advising him that "the ratings assigned will be shown on the distribution sheets on file in the office of the Division Superintendents and Car Distributors." The practice stated, in that circular, has been, since its issue, consistently adhered to.

The change in the system of rating the mines, and the successive modifications in regulations affecting car distribution were made only in the desire to meet changed conditions and to do impartial justice to all shippers. From January 1, 1900, distribution was made of all home and foreign railroad cars, there being excluded from distribution cars placed for fuel for the company, and individual cars, whether or not owned by the mine to which distribution was made. Because of the anthracite strike in 1902 and the consequent increased demand for bituminous coal, individual cars not owned by the shipper were from February 1, 1903, subjected to distribution. On March 28, 1905, cars consigned by other railroads for their own coal supply were excepted from distribution. From April 25, 1905, box cars distributed for shipment of coal east and west were not counted against the operators' pro rata supply of open cars for coal, for the reason that box cars were mainly used for the shipment of smithing coal to points west, and were more expensive to load because special arrangements had to be made for them at the mine tipples. The operators desired the exclusion of box cars from general distribution because, in addition to the reasons before stated, counting them in the allotment reduced the supply of hopper cars for shipment of coal to the eastern markets. The railroad desired the exclusion because, while aiding the development of the movement of smithing coal to the West, it also furnished a back loading for foreign box cars homeward bound to the West, which otherwise would have had to be moved empty. On October 20, 1905, individual cars loaded for or on account of the owner of the cars were excluded from distribution because it had been found to be impossible for the car distributors to know who actually owned individual cars, and because colorable transfers of ownership of individual cars were made. From and after January 1, 1906, all cars for the coal supply of any railroads, and all individual cars assigned by the owner for loading at specified mines, have been charged against the mine at which such cars are placed and treated as part of its pro rata distribution. Prior to January 1, 1906, the distribution was made on the basis of wooden cars of 25 tons capacity, a steel car being counted as equivalent to two 25-ton wooden cars. After that date steel cars of 80,000 pounds capacity and less have been counted in the distribution as equivalent to wooden cars of 35 net tons and steel cars of 100,000 pounds capacity are counted as the equivalent of 1½ wooden cars of 35 net tons each. Before June, 1903, the General Superintendent of Transportation, and since that date the Superintendent of Freight Transportation has had charge of the distribution of cars between the general divisions, and the General Superintendent of each general division has had charge of the distribution between his divisions, and the Superintendent of each division has had charge of the distribution on his division. Each distributing officer is provided with a sheet showing the name of each mine, with that mine's rating in tons and in cars of 35 tons capacity, but excluding from the rating all mines whose whole output is taken for company coal. Each mine daily gives notice of the number of cars needed for the next day's shipments. The daily rating of particular mines, and therefore the aggregate daily rating of any one district, as shown on the rate sheets, are at all times liable to be affected by changed conditions. Therefore the officer having direct charge of the distribution makes on each day an adjusted rating to meet actual conditions, such as a mine's order for cars less in number than its rating, or a mine's idleness by reason of an accident to machinery, or its lack of miners. The distributing officer reports daily to the Superintendent of his division the distribution as made, and each Superintendent reports the distribution weekly to the General Superintendent. It has been at all times the duty of the supervising officers to carefully scrutinize those reports in order to see that the distribution has been fairly and accurately made.

In order that it might be advised whether the distribution of cars as between shippers had been in fact fairly and impartially made by the distributing officers and in accordance with the rules, the committee employed the Audit Company of New York to investigate the facts. The Audit Company, in a report of 2,678 pages, states:

"We have compared the facts set forth in the mine sheets and special orders, with the testimony taken before the Interstate Commerce Commission in Philadelphia in the late spring of the present year. We have carefully read and considered so much of that testimony as relates to the distribution of cars, and consider that few, if any, of the matters alleged before the Commission to the prejudice of the officers of the railroad company are borne out by the results of our examination, as set forth in this report. Many of the cases of seeming preferences and discriminations—both those attended by special orders and not so attended—have been examined into by us with the result of finding that the officers of the railroad company have fair operating or other reasons to present in explanation of such seeming preferences and discriminations. Our company is of opinion, therefore, and reports as its best judgment that in general the distribution of cars was controlled and administered by the officers of the railroad company in good faith and without showing continued preferences and discriminations as toward the owners of bituminous coal mines."

In connection with the subject of car distribution, the committee has carefully investigated the relations of the Berwind-White Coal Mining Co. to the railroad company. The lease of Harsimus Pier, in New York harbor, is an arrangement by which the railroad secures a profitable traffic of great magnitude; so handles that traffic that cars can be unloaded with the minimum of delay, and returned to the mines for reloading; has performed, at a cost reasonable to the railroad, the railroad's duty of transferring coal from pier to boat; obtains, without cost to the railroad, an adequate coaling wharf for its large fleet of tugs and lighters plying in the port of New York; receives an income at the rate of 4 per cent. on the assessed valuation of the ground leased; has received reimbursement for the cost of building the pier; gives to the railroad company full use of its facilities at South Amboy Coal Terminal for handling the business of general and smaller shippers; and does not in any respect constitute a preference to the Berwind-White Company.

The non-weighing at certain periods of the cars for Harsimus, and the billing of those cars for freight at estimated weights, were shown by the testimony taken by the Interstate Commerce Commission to have been ordered only to relieve freight congestion, existing at the time because of the reconstruction of yards then in progress, and, therefore, to have been beneficial to other shippers, and did not result in any loss to the railroad, because the estimated weights exceeded the actual weights of other similarly loaded cars, and did not constitute a preference in favor of the Berwind-White Company.

The sales to the Berwind-White Company in July, 1902, of 727 steel hopper cars from the railroad equipment, and of 272 like cars, which were being built by the Pressed Steel Car Co. on the order of the railroad, and of 500 cars then building, to the Keystone Coal & Coke Co., were at a time when the congestion on the line was so great that it became a question of how best to meet the demands of the consumer, and the executive officers, after most careful consideration, ordered the sale of these cars, and the taking of space in the shops at a later date to replace them.

Among individual complaints investigated, concerning various departments, were the following:

A complaint was made with regard to the abandonment of Snyder Station between Social Hall and Blairsville on the West Penn division. The committee investigated and found that the

station had been abandoned, because there were only five families living within a radius of two miles therefrom, and because a public road is under construction which will give those families better facilities to and from Blairsville than they had to and from Snyder's Station; and that several of the officers of the company had, upon receipt of letters from the complainant, written him courteously, fully explaining the reasons for the abandonment of the station.

A complaint was made as to insufficient wages paid at the Kensington freight station, the allegation being that the employees at that station can make only from 85 cents to $1 per day. The committee investigated and found that the force at that station is paid on the tonnage basis, and that the average earnings of the men, assuming that they work full time, is: for shipping clerks, $65 to $70 per month; and for truckers, loaders, and packers, from $55 to $60 per month.

An anonymous complaint was made as to mismanagement and corrupt practices at the docks at Erie, and as to certain unfair treatment alleged to have been given to a yardmaster at Erie some years ago The committee investigated the matter thoroughly and found nothing to sustain the charges.

A complaint was made as to unfair discriminations made by S. W. Dunlap, Yardmaster of the Philadelphia Terminal division, in the distribution and movement of loaded coal cars as between the coal yards in the neighborhood, it being alleged that Mr. Dunlap had received presents of coal from one of the dealers. The committee investigated the matter, examined Mr. Dunlap, and found the charges unsupported by facts.

A complaint was made against G. M. Sexauer, Piecework Inspector at the Pitcairn Shops, the allegation being that Mr. Sexauer had misappropriated the company's tin for roofing his house, and for the manufacture of tin boxes sold for his individual account, and that Mr. Sexauer takes part of the employees' pay. The committee investigated the matter and found that the charges were unfounded. Mr. Sexauer produced the receipted bills for the tin purchased for roofing, which was furnished by a Pittsburg dealer.

A complaint was made against M. W. Mansfield, late Superintendent of the Vincennes division of the Vandalia. The committee investigated and found that the charges related to matters which had happened in, or about, the year 1889; that they had some years ago been brought to the attention of, and fully investigated by, the officers of the Western Lines, and had been found to be unsubstantiated.

The committee has thoroughly investigated the relations, howsoever made, of the officers and employees of the several railroad companies to corporations, firms, and individuals, selling materials, or supplies, to any of the several companies, or shipping freight over any of the lines of the several companies. In its consideration of this subject, the committee has strictly applied the principles, stated in its preliminary report, and prescribed in the by-laws of the company that "the duty of an officer, or employee, to the railroad company, which he has undertaken to serve, forbids him to gain a personal profit at the expense of the railroad company by his participation in contracts with, or sales to, the railroad company; and that that same duty equally forbids an officer, or employee, to unduly favor any customer, to the disadvantage of any other customer, of the railroad company; or to place himself under such personal obligations to any customer of the railroad company as may possibly interfere with the officer's, or employee's full and faithful discharge of his plain duty." When it is remembered that the several companies have in their services almost 200,000 officers and employees, it is not surprising that some few of that large number have been found to have erred.

In its preliminary report the committee also said: "In its early history the great problem for the company was the development of industrial enterprises in the territory through which its lines ran, in such a manner as to create and secure traffic for the company. To-day the problem is that of providing adequate facilities in line, rolling stock and movement for the business of the country, which rapidly outgrows such facilities. While under former conditions it was right that officers and employees should have been encouraged to invest their own money in or to personally assume financial obligations for the purpose of developing industrial enterprises on the line of the road, for the practical reason that if officers and employees did not so invest it would have been difficult to induce other people to make such investments; it nevertheless has been always understood that no such investment of money or assumption of financial obligation was permissible if it affected the officer's or employee's performance of his duty.

"Under the conditions of to-day, as they have been stated, it is essential that all officers and employees should be absolutely free to discharge their duties impartially. Applying this principle to the coal trade as an illustration, the keen competition of to-day requires every officer and employee of the Pennsylvania to part with any investments which he has in the shares of any coal producing company, and also to part with any interest which he has in or with any firm or individual mining coal, on any of the lines of the Pennsylvania System; and every officer and employee should be required to refrain from any investment whatsoever which may possibly prejudice or affect the interests of the company or interfere with the company's full discharge of its duty to the public."

Following that preliminary report orders were at once issued by the President to carry into effect its recommendations. A reasonable length of time has been given for compliance with this order, and it is recommended that any officer or employee who has disobeyed it be dismissed from the service.

A mistaken public opinion, misinformed as to the facts, because of the publication of portions, and not the whole, of the testimony of the witnesses before the Interstate Commerce Commission, and therefore basing its conclusions upon insufficient premises, has done grave injustice to the whole service of the Pennsylvania Railroad Company. That service is of more than 60 years' growth; it is constituted in the main of educated, trained and self-respecting men, whose honorable lives have won the esteem of those who know them best; it has its traditions of loyalty; and it has had, in its successive officers, examples of unselfish devotion to duty and steadfast adherence to the right.

Only 51 of the 198,930 officers and employees of the companies constituting the Pennsylvania Railroad System were examined as witnesses before the Interstate Commerce Commission, and of this number 21 officers and employees were shown to have acquired by investment, and in a few cases by gift, any interest in coal companies or properties. This committee has interrogated 2,505 officers and employees, there being included in that number every officer of the several companies whose individual action, or whose order to any subordinate, could effect any undue and unreasonable discrimination for or against any customer of the railroads or could prejudice the interests of the company in any way. Of the 2,505 officers and employees, 266 were found to have interests in coal or other corporations or firms or with individuals. The majority of those interests are in corporations whose shares are dealt in on the open market. Of those 266 officers and employees, 251 had acquired their interests by purchase. The few remaining officers and employees received gifts of shares, or interests, in various corporations. The committee regrets that any officer or employee of the Pennsylvania should have so far forgotten that which was due to the service, and that which was also due to his own character, as to accept a gift whose acceptance might bring a suspicion of conflict between his official duty and his personal interest. The committee has reported to the Presidents of the several railroad companies, for appropriate action, the names of those officers and employees who have, in the judgment of the committee, been found to have failed in the performance of their duty. As the final result of its examination of the whole subject committed to it, the committee reports that, with few exceptions, the officers and employees of the companies constituting the Pennsylvania system have been faithful to duty.

Details of Pacific Locomotive for National Railroad of Mexico.

In the description of the Pacific (4-6-2) locomotive built for the National Railroad of Mexico by the Baldwin Locomotive Works, published in the *Railroad Gazette* of Feb. 1, 1907, attention was called to the bifurcated connecting rod and the fastening between the rear and main frames. Through the courtesy of the builder illustrations are given here of these parts. The connecting rod is a steel casting open or bifurcated at the crosshead end with a gap wide enough to span the forward axle at the crosshead end and webbed at the crankpin end in order to obtain the rigidity needed to withstand the vertical stresses that are set up at that point. The opening at the axle has a clear space of 27 in. by 38¼ in. with bars 3 in. wide and 3½ in. deep at the top and bottom. The stub end at the crosshead is cut with shoulders at the front and back so as to relieve the bolts of all shearing stress, and into this space the head is fitted and held by three 1¼ in. bolts that pass through from the top to the bottom, and two of the same size that take the lips at the rear. This head is thus made to serve the double purpose of binding the ends of the connecting rod frame together and carrying the wristpin brass. For the latter purpose, the head is fitted with a keyway and adjusting screws, which serve to fix the position of the brass; the oil cup, for which, is cut in the upper strap of the connecting rod. The wristpin has a diameter of 4½ in. and a length of 3½ in.

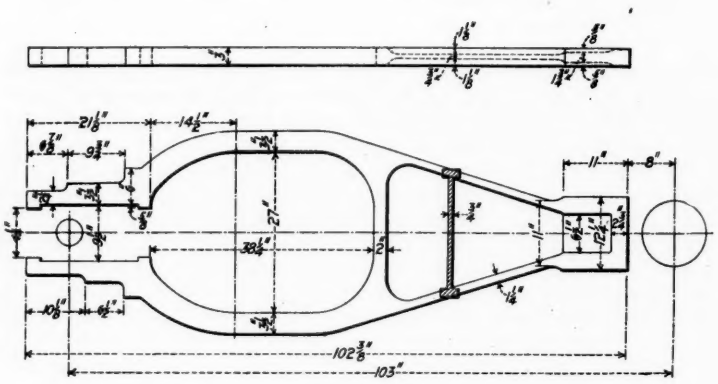
At the crankpin end, there is a heavy U strap bolted to the stub of the connecting rod by three 1⅛ in. bolts that are relieved of shear by two keys that are driven in between the strap and the stub end at the top and bottom, respectively. The brasses are fitted in this strap in the usual manner and are adjusted by a key with a keeper at the bottom. The cranked axle offers a bearing for the rod 11 in. in diameter and 5 in. long.

The frame for such an engine must necessarily be very rigid in itself, not only on account of the power of the engine, but because of the difficulty of introducing cross-bracing at the front. Each side is made in three sections. The main portion includes the pedestals for the three pair of driving wheels. At the front there

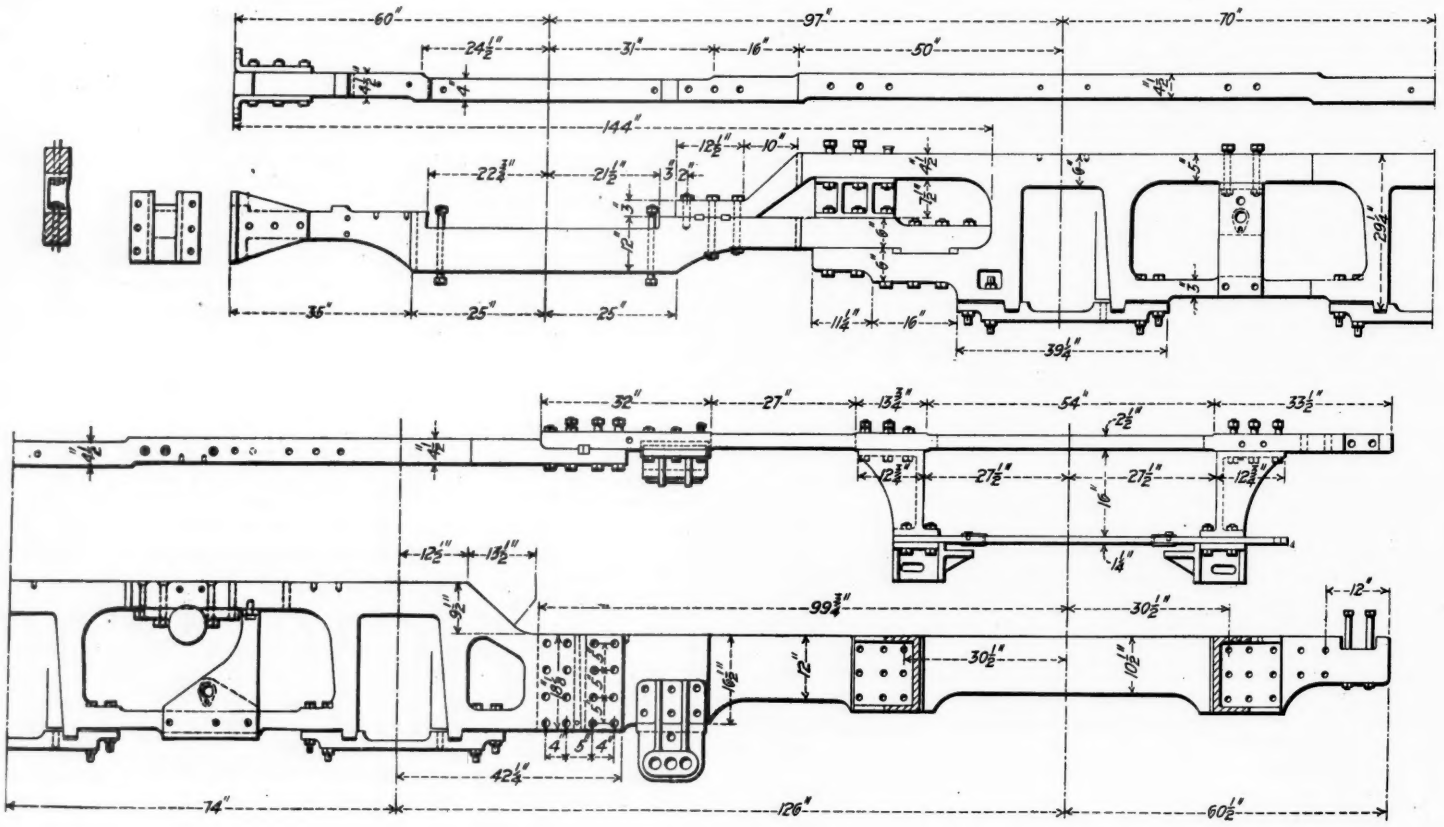
is a single bar that is fastened to the upper and lower rails of the main frames, as shown in the illustration. These rails or tongues are each bolted to the front rail and in addition a steel casting is inserted with three 1⅜-in. bolts at the top and bottom. The three at the top take the upper rail or tongue of the main frame, and those at the bottom pass through both the front rail and the main frame. In addition to these there are three bolts holding the front bar to the top and bottom bars each. At the back end the front rail is lipped down into the lower tongue and keyed with two keys, besides which two keys are used for fastening to the upper tongue. With this design the opening of the jaws is prevented from spreading and the working of the keys avoided.

The rear frame is held to the slab section of the main frame by sixteen 1¼-in. bolts spaced 4 in. and 5 in. between centers, in addition to which a vertical key is inserted between the two parts.

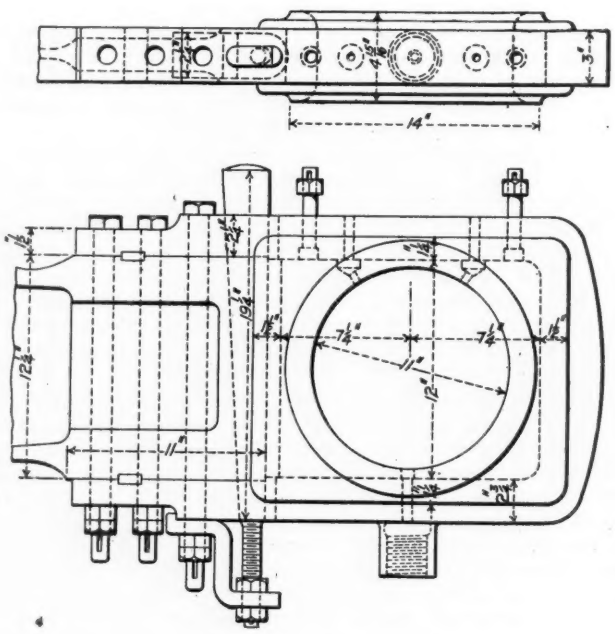
Back of this the auxiliary frame for the trailing truck pedestals, is held by two cast steel brackets, bolted to the rear section of the frame. These brackets are each held by nine 1⅛-in. bolts and stand out 15¾ in. and thus hold the auxiliary frame of 1¼ in. by 10¾ in. steel in place.



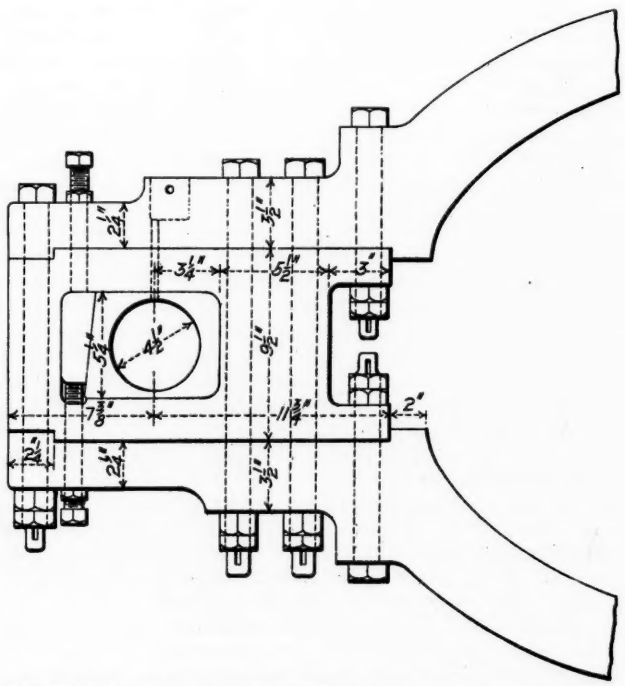
Bifurcated Inside Connecting Rod for Pacific Locomotive for Railroad of Mexico.



Frame of Pacific Locomotive for National Railroad of Mexico.



Rear Stub End of Inside Bifurcated Connecting Rod.



Front Stub End of Inside Bifurcated Connecting Rod.

GENERAL NEWS SECTION

NOTES.

The Texas legislature has passed a bill giving interurban electric railways the right of eminent domain.

The Louisville & Nashville has made an increase of 10 per cent. in the wages of locomotive engineers, together with more favorable rates for overtime.

The Supreme Court of the United States has decided the case of the Gulf, Colorado & Santa Fe vs. the Railroad Commission of Texas, involving state freight rates, favorably to the state.

At Milwaukee, Wis., the Post Office Department has put in use automobile mail wagons, 15 ft. long and 5 ft. wide, for the collection of mails, in which there are racks for letters and space for a man to sort them while on the road.

According to consular reports, the net tonnage of coastwise freight carrying steamships entering the port of New York during 1906 was 5,589,090 tons, and the tonnage of vessels clearing from New York was 6,102,974 tons. The freight traffic of these steamship companies increased 25 per cent. during 1906, and the permanent carrying capacity, it is estimated, increased an equal percentage.

The legislature of Montana has passed a stringent railroad law, creating a commission with extensive powers. The law is said to be a combination of the Federal, the Wisconsin, the Iowa and the Texas railroad laws, which seems to be understood as meaning that it includes the most radical features of these several laws. The Montana commission is empowered to make changes in rates on its own motion.

Everybody is in favor of having something done to do away with the shortage of freight cars, but, as in other things, it is difficult to find the individual who wishes to have the pressure of any ameliorating measure applied to himself. The city of Chicago is the birthplace of many reforms on paper, but Board of Trade men just now are demanding that seven days' time be allowed free for the unloading of grain cars. If this is not done, say the complainants, serious harm will result to the Chicago market.

What is said to be the largest settlement ever made by a railroad corporation in a suit for damages for personal injuries was announced at White Plains, N. Y., last week, when the action of Edward Kleist, of New Rochelle, for $200,000 damages against the New York Central had been settled. The company gave a check for $50,000 to settle the suit. Mr. Kleist, who is 50 years old, on December 19, 1905, was riding in a New Haven coach when a Harlem train crashed into it at 105th street, Manhattan. He is still suffering from his injuries.

The Interstate Commerce Commission has canceled its Tariff Circulars 8A and 9A and promulgated Tariff Circulars 10A and 11A, containing regulations governing the construction and filing of tariffs. The freight tariff regulations are to become effective on May 1 and the passenger tariff regulations on June 1, 1907. To give ample time for consideration of points raised in objections to Rule 15 of Circular 8A and Rule 17 of Circular 9A, those paragraphs have been omitted from the revised regulations; but in so doing the Commission does not express any opinion or make any decision upon the points involved in the omitted paragraphs.

The cases of the Union Pacific and the Chicago, Burlington & Quincy against the various county treasurers of the state of Nebraska, involving the tax rate on the property of the railroads and calling into question the administration of the Nebraska state tax law, have been decided adversely to the railroads by the Supreme Court of the United States. The decision was announced by Justice Holmes. This decision of the Supreme Court means that the railroads parties to the suit must pay into the treasuries of the sixty-one counties interested an aggregate of about $3,100,000 of taxes now due, including penalties. This includes the taxes for 1904, 1905 and 1906. The railroads had offered about $2,200,000, so that the amount really involved was about $900,000.

American Locomotive Company Changes.

J. E. Sague, M.E., Vice-President of the American Locomotive Company, has resigned. Herman F. Ball, Vice-President of the American Locomotive Automobile Company, has been appointed Vice-President in charge of Engineering of the American Locomotive Company, and David Van Alstyne, Manager of the Brooks Works of the company at Dunkirk, N. Y., has been made Vice-President in charge of Manufacturing. All these appointments take effect March 1. Mr. Sague has been identified with the locomotive building industry since 1892, when he became Mechanical Engineer of the Schenectady Locomotive Works, which office he held until the formation of the American Locomotive Company. He is a graduate of Stevens Institute, and was engaged in railroad work from 1883 until 1892. As Vice-President of the American Locomotive Company since June, 1904, Mr. Sague was in charge of the engineering and manufacturing branches. His ability is acknowledged by his associates in the American Locomotive Company and recognized by all those with whom he has been brought in contact in the discharge of his duties. Mr. Ball, Vice-President in charge of Engineering, was until June last Superintendent of Motive Power of the Lake Shore & Michigan Southern. Mr. Ball was born at Altoona, Pa., Dec. 17, 1867, and entered railroad service in 1884, and from that time until 1890 was identified with the mechanical department of the Pennsylvania, leaving there to go with the Lake Shore & Michigan Southern. Mr. Van Alstyne was born June 14, 1865, at Louisville, Ky., and educated at the Massachusetts Institute of Technology. In 1886 he was employed as machinist apprentice on the Louisville & Nashville and served eight years on that same road in the machine shops and as locomotive fireman and as roundhouse foreman. For some four years Mr. Van Alstyne was Superintendent of Motive Power of the Chicago Great Western, resigning there in May, 1904, to become Mechanical Superintendent of the Northern Pacific. On October 1, 1906, he became Manager of the Brooks Works of the American Locomotive Company.

Pennsylvania Increases Station Agents' Pay.

Station agents and their helpers on the Pennsylvania Railroad have received increases averaging 12.8 and 13.7 per cent. in their wages. The increase amounts to $446,736 annually. The order applies over all of the company's lines east of Pittsburg and Erie, and is to date from Feb. 1. In the readjustment 5,471 employees will be affected. Of these 745 are station agents and 4,726 are employees in what is known as station forces. The total wages paid monthly under the old scale was $275,562, and the revision brings it up to $312,790, an increase of $37,228 a month.

In announcing the raise, the management makes the following statement:

"Freight and passenger agents are classed among our most faithful and trustworthy employees, and on their intelligence and efficiency, as well as that of the forces under their charge, largely depends the successful conduct of the company's business interests intrusted to their care. The adjustment was ordered to better equalize their rates of pay with those of other classes of employees on the system at large; that they might compare favorably with positions of corresponding importance in the commercial world, and to show material appreciation of the earnest efforts of these employees in the past."

New York State Rules for Drawbridges.

The New York State Railroad Commission, having examined the conditions existing at drawbridges on the railroads of the state, has adopted rules for greater safety. The rules provide for protection by home and distant signals, 50 and 1,500 ft. respectively, and derails not less than 500 ft. from end of draw, where possible, all interlocked, so that the first movement to open the draw will set both signals. The movable rails on ends of drawbridges must extend beyond the end of the bridge and connect with shore rails by a mitre joint, the ends to meet in a trough and be governed by levers suitably interlocked with the signals.

The Paramount Duty.

Honest and impartial men are convinced that stock-watering, manipulation and speculation by "insiders" have been carried on unscrupulously. So long as this belief exists, and there are so many facts to sustain it, railroad men cannot say that the murmurings against them are causeless, or that a duty is not laid upon them to restore public confidence by adopting and enforcing honorable and open financial methods. But an even more grievous reproach lies in the bad reputation of American railroads for safety. The lamentable accumulation of disasters, with great loss of life, during the past six months can but heighten the common feeling, both at home and abroad, that our railroad management is marked by lack of foresight and by something like recklessness. So long as this sentiment prevails, and has so much to base itself upon, it is of no use to boast about our vast mileage and low freight rates. To make operation safer is the first obligation. It is well to stop rebating; it is desirable to enforce publicity; it is necessary to make the greatest railroad magnates obey the law—but the chief demand of the people just now is that every known safeguard be employed, every consequent outlay be faced—even if surpluses and dividends have to be cut—every form of vigilance be observed, every method of discipline enforced that can free Americans from

the haunting fear of accident whenever they set out on a railroad journey.—*Evening Post, New York.*

A New Car Seal.

A new car seal is shown in the accompanying engraving. It is made of tinplate, is 8½ in. long over all, and the tin band is 11/32 in. wide. The upper end of the band for ½ in. is bent backward and down against the band and has a semi-elliptical hole near its end, forming a snap or catch like that on a bracelet. The lower or enlarged portion of the seal is a pocket into which the upper end is thrust, the small corrugation seen near the upper end sliding in a groove in the pocket wall, guiding the end to place. Once inserted the end cannot be withdrawn without destroying the seal.

Several advantages over the old style seal are claimed. The first and most important is that sealing can be done much faster. At night, especially, with the lead seals, press, book and lantern a

Estell Car Seal.

man has his hands full and spends much more time applying the seals than by use of the device here described. The numbering is put on the tin band and may be easily read. On lead seals the numbering is too often quite indistinct. The tin seals are numbered consecutively and the agent is required to account for every one issued to him; a record being kept of all sent him, and his reports being expected to show what becomes of each one.

The price of the seal in small lots is $3 a thousand, f.o.b. destination in the United States. For larger quantities, or where sold under contract, the price would be less. They are made and sold by the Estell Car Seal & Equipment Co., Denver, Colo.

Reductions of Passenger Fares.

The State Railroad Commission of Wisconsin has issued orders to the Chicago & North-Western, the Chicago, St. Paul, Minneapolis & Omaha and the Chicago, Milwaukee & St. Paul to reduce passenger fares from 3 to 2½ cents within twenty days. It is said that the orders will not be contested. As a result of the decision of the Commission it is expected that various bills now in the Legislature providing for a two-cent fare will be withdrawn or killed. In the opinion of the Commission the North-Western will still earn 6½ per cent. on its property used for intrastate passenger traffic, and the Omaha 5½ per cent.

At Jefferson City, Mo., the Senate has passed the House two-cent rate bill, after amending it to conform to the Senate bill and adding a penalty of a fine of $100 to $500 for each violation. The bill is now in the House for concurrence in the amendments.

In West Virginia last week the Conference Committee agreed to the Senate two-cent bill with a limitation exempting lines of fifty miles or less. It is considered certain that the Senate measure will become a law.

In Indiana the Senate two-cent fare bill, amended so as to provide for 2½-cent cash fares when tickets are not bought, and for the rebate of this extra amount at any ticket office, has passed the House, 87 to 7, and is now a law.

In Minnesota the House has passed the two-cent fare bill and sent it to the Senate.

In Nebraska, by a vote of 90 to 0, the House passed the two-cent fare bill and it has gone to the Governor.

A Welcome.

"Shonts, wha hae wi' Wallace fled,
Shonts, wham Taft pats on the head,
Welcome, Interborough's head,
Wi' more salary!

"Wha said aught of 'traitor knave,'
Wha remarked on 'cowards' grave,
Wha said, 'Base as is a slave,'
When you quit, T. P.?"

—*Charles S. Putnam, in the New York Sun.*

TRADE CATALOGUES.

Forgings.—The Cleveland City Forge & Iron Co., Cleveland, Ohio, has prepared a hand-book or manual of information concerning the round and square bars, turnbuckles, clevis nuts and other forgings made by the company. It is intended for engineers, architects, mechanics and car builders. Besides the detailed information concerning these products it gives some useful tables. It is 4¼ x 7, bound in flexible leather, has 56 pages of printed matter and 24 blank pages for memoranda.

Rhodes, Curry & Co.—This car building company, Amherst, N. S., is distributing an unusually neat and convenient card-case with memorandum book attached.

Manufacturing and Business.

John McKinnon has been appointed General Manager of the Kalamazoo Railway Supply Co., Kalamazoo, Mich.

The Kennicott Water Softener Co., Chicago, has received an order from the Baltimore & Ohio R. R. for a softener having an hourly capacity of 40,000 gals., to be installed at East Side, Philadelphia, Pa.

W. W. Hoit, who for a number of years has been general yardmaster of the New York Central & Hudson River at West Albany, has gone to the Quincy, Manchester, Sargent Company, with office at New York.

The Universal Portland Cement Co., Chicago, announces the appointment of F. G. Bentley as Western Traffic Manager, with office at Chicago, and L. C. Bihler as Eastern Traffic Manager, with office at Pittsburg.

The Electric Storage Battery Company has opened a sales office in the Candler Building, Atlanta, Ga., in charge of Harold H. Seaman, formerly engineer of the Cleveland sales office of the company. His present territory consists of Tennessee, North Carolina, South Carolina, Georgia, Florida, Alabama and Mississippi.

The annual report of the Chicago Pneumatic Tool Company for the year ended December 31, 1906, shows net earnings of $1,001,550; the amount available for dividends was $686,469, out of which 4 per cent. on the $6,108,800 capital stock was paid, leaving $442,117 surplus for the year. During the year $195,000 was borrowed to acquire the business of the Philadelphia Pneumatic Tool Company and for the organization and extension of subsidiary companies in foreign countries.

A large addition to the steel plate fan shop of the American Blower Co., Detroit, Mich., is about completed and will be ready for occupancy in about 30 days. Plans are now being prepared for a large addition to the power plant and to the engine building department. So rapidly has the plant grown that all available space on the present site has been used up. As a sample of this growth, a few years ago the engine department was almost a side line, but now, since the new vertical, self-oiling engine has been developed, this department is taking first place and is forcing an entire re-arrangement of the plant.

Col. John T. Dickinson, who was recently elected Vice-President of the Bliss Electric Car Lighting Company, of Milwaukee, was born in Houston, Texas, June 18, 1858, and was educated at the University of Virginia, where he graduated in the law department in June, 1879. From 1882 to 1888 he served in Texas as Secretary of the state board in building the Texas state capitol at Austin, and from 1889 to 1894 was Secretary of the World's Columbian Commission in Chicago. Soon after the close of the World's Fair, Col. Dickinson went to New York City, and since that time, as Second Vice-President of the Consolidated Railway Electric Lighting & Equipment Company, has given his attention to the exploitation and sale of electric car lighting equipment for railway passenger cars. He enjoys a wide circle of friends covering the entire railroad field. As Vice-President of the Bliss Electric Car Lighting Company, he will be in charge of the eastern territory, making his headquarters at the new offices in the Night and Day Bank Building, Fifth avenue and Forty-fourth street, New York City.

Col. John T. Dickinson.

Iron and Steel.

The Kansas City, Mexico & Orient has ordered 40,000 tons of 70-lb. and 80-lb. rails from the United States Steel Corporation.

The Norfolk & Southern has ordered 1,500 tons of rails; the Detroit, Jackson & Chicago, 1,600 tons and miscellaneous orders for other electric roads aggregate 2,000 tons.

The Minneapolis, St. Paul & Sault Ste. Marie has ordered 1,100 tons of steel for bridges; the St. Louis & San Francisco 300 tons, and the Chicago, Lake Shore & Eastern 300 tons.

The South Manchuria Railway, which is being built by the Japanese Government, has ordered 50,000 tons of 60-lb. rails from the United States Steel Corporation, and 8,500 tons of bridge material.

The Grand Trunk has ordered from the American Bridge Co. 3,000 tons of steel for new shops. The New York, New Haven & Hartford has ordered about 3,500 tons of bridge material.

OBITUARY NOTICES.

W. L. Smith, General Agent of the Illinois Central at Memphis, Tenn., was drowned on February 22, while duck hunting. Mr. Smith was about 45 years old, and had been on the Illinois Central for the last 20 years.

William A. Thrall, formerly and for many years General Passenger and Ticket Agent of the Chicago & North-Western, died last week at his home in Chicago, after several months' illness. Mr. Thrall was 72 years old. He was born at Sharon, N. Y., and began railroad work in 1858 on the Galena & Chicago Union, now part of the Chicago & North-Western. After a few years he was made Assistant General Passenger Agent of the Illinois Central, where he remained until 1872; he was then appointed General Ticket Agent of the Chicago & North-Western, and in 1873 was appointed General Passenger and Ticket Agent, which position he held until he retired from railroad work 10 years ago. Mr. Thrall originated the simplex ticket, the present mileage ticket and the credential system. He was a Director of the Columbus Safe Deposit Company, President of the American Railway Guide Company and a member of many Chicago clubs.

William A. Thrall.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)

Canadian Society of Civil Engineers.

At a meeting of the mechanical section held on Feb. 28, a paper on "Gas, Gas Engines and Gas Producers," by J. Seton Gray, was read.

Railway Signal Association.

The regular March meeting of this association will be held at the Great Northern Hotel, Chicago, on Monday, the 18th. The subjects for discussion are: 10 a.m., General Specifications for Electric Interlocking; 12 m., Installation and Maintenance of Storage Batteries; 2.30 p.m., Signal Lamps; 3.30 p.m., Special Committee Report on Interlocking and Block Signals.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Denver & Rio Grande.—D. E. Cain, Assistant to the Vice-President in charge of operation, has resigned.

Isthmian Canal Commission.—John F. Stevens, Chief Engineer of the Panama Canal and Vice-President of the Panama Railroad, has resigned. Major G. W. Goethals, of the United States Engineers, has been appointed Chairman of the Commission, succeeding T. P. Shonts, resigned, and also Chief Engineer, succeeding Mr. Stevens. Major D. D. Gaillard and Major W. L. Sibert, both of the United States Engineers, and Senator J. C. S. Blackburn, of Kentucky, have been appointed Commissioners. All appointments are effective March 4.

Seaboard Air Line.—W. A. Garrett, First Vice-President and General Manager, has been elected President, succeeding Alfred Walter, deceased.

Western Pacific.—F. W. M. Cutcheon has been appointed General Counsel, with office at New York, effective March 1.

Operating Officers.

Canadian Pacific.—G. J. Bury, General Superintendent at Winnipeg, Man., has been appointed General Manager in charge of maintenance and operation of western lines, with office at Winnipeg, Man., effective March 1. Mr. Bury was born in Montreal in 1866 and, after graduating from Montreal College, began railroad work in 1883 as a junior clerk in the purchasing department of the Canadian Pacific. After being made secretary to the General Manager, he was, in 1890, appointed Assistant Superintendent at North Bay, Ont.; he was later made Superintendent at that place, and in 1899 was transferred to Fort William, Ont., and two years later to Cranbrook, B. C. In 1902 he was promoted to be Assistant General Superintendent at North Bay and later in the same year was made General Superintendent at that place. In 1904 he was appointed General Superintendent of the Central division, with office at Winnipeg, where he has been until his present promotion.

R. Marpole, General Superintendent at Vancouver, B. C., has been appointed General Executive Assistant, with office at that place.

Central of Georgia.—See Georgia, Florida & Alabama.

Cincinnati, New Orleans & Texas Pacific.—See Seaboard Air Line.

Georgia, Florida & Alabama.—J. C. O'Dell, Superintendent of the Central of Georgia at Savannah, Ga., has been appointed General Manager of the Georgia, Florida & Alabama, succeeding W. B. Denham, resigned.

Mobile, Jackson & Kansas City.—T. F. Whittelsey, Second Vice-President and General Manager, has resigned. H. S. Jones, Chief Engineer, has been appointed to the new office of General Superintendent, reporting to the President, with office at Mobile, Ala., effective March 1, and heads of all departments heretofore reporting to the General Manager will hereafter report to the General Superintendent.

Northwestern Pacific.—James Agler, General Manager of the California North-Western, has been appointed General Manager of the Northwestern Pacific, with office at San Francisco, Cal. B. F. Porter, Second Vice-President and General Manager of the San Francisco & Northwestern, has been appointed Assistant General Manager of the Northwestern Pacific, in charge of operated lines north of Shively tunnel, with office at Eureka, Cal.

St. Louis Southwestern.—F. J. Hahn, chief despatcher at Pine Bluff, Ark., has been appointed Superintendent of Transportation, with office at Tyler, Tex., succeeding A. B. Liggett, deceased.

Seaboard Air Line.—H. M. Waite, Superintendent of the Chattanooga division of the Cincinnati, New Orleans & Texas Pacific, has been appointed Superintendent of the Atlantic & Birmingham division of the Seaboard Air Line.

Southern Pacific.—D. Urquhart, Superintendent of the Commissary Department, has been appointed to the new office of Superintendent of Dining Cars, Hotels and Restaurants.

Tavares & Gulf.—A. W. Brittain has been appointed General Manager, with office at Clermont, Fla., succeeding, as General Manager, R. H. England, Vice-President and General Manager, resigned on account of ill health, effective March 1.

Traffic Officers.

Chicago, Burlington & Quincy.—A. C. Ballach, Assistant to the Passenger Traffic Manager, has resigned.

Delaware & Hudson.—W. J. Mullin, Assistant to the Second Vice-President, has been appointed to the new office of General Traffic Manager, with office at Albany, N. Y.

Marcellus & Otisco Lake.—R. L. Scott, Superintendent, has been appointed also Traffic Manager, with office at Marcellus, N. Y.

Northwestern Pacific.—R. X. Ryan, General Passenger and Freight Agent of the California North-Western, has been appointed General Passenger and Freight Agent of the Northwestern Pacific, with office at San Francisco, Cal.

Southern.—The passenger and freight agency at Havana, Cuba, heretofore in charge of C. E. Gay, General Agent, has been abolished.

Engineering and Rolling Stock Officers.

Baltimore & Ohio.—L. E. Haislip has been appointed Assistant Division Engineer at Pittsburg, Pa., succeeding E. D. Jackson, transferred.

Cleveland, Cincinnati, Chicago & St. Louis.—F. W. Smith, Principal Assistant Engineer, has been appointed to the new office of Construction Engineer. O. E. Selby, Bridge Engineer, has been appointed Engineer of Bridges and Structures. A. L. Kuehn, Superintendent of Maintenance, has been appointed to the new office of Engineer of Track and Roadway.

Mobile, Jackson & Kansas City.—See Mobile, Jackson & Kansas City under Operating Officers.

Northwestern Pacific.—F. K. Zook, Chief Engineer of the California North-Western, has been appointed Engineer of Maintenance of the Northwestern Pacific, in charge also of such new construction as may hereafter be assigned to him.

Oregon Short Line.—W. F. Easton, roadmaster of the Southern Pacific at Ogden, Utah, has been appointed General Track Inspector of the Oregon Short Line, of the Southern Pacific lines east

of Sparks and of the Union Pacific lines west of Green river, with office at Ogden, Utah.

Southern Pacific.—See Oregon Short Line.

Union Pacific.—See Oregon Short Line.

Purchasing Agents.

Northwestern Pacific.—H. W. Ellicott, Assistant General Purchasing Agent of the Southern Pacific, has been appointed Purchasing Agent of the Northwestern Pacific.

Southern Pacific.—See Northwestern Pacific.

LOCOMOTIVE BUILDING.

The Mobile, Jackson & Kansas City has ordered five locomotives.

The Chicago & Milwaukee Electric is reported in the market for four switching locomotives.

The Chicago & Milwaukee Electric has ordered two electric locomotives from the General Electric Company.

The South & Western denies having ordered 120 locomotives, as reported in the *Railroad Gazette* of February 22.

The Norfolk & Western denies having ordered 25 additional locomotives, as reported in the *Railroad Gazette* of February 22.

The Lester Mill Company, Lester, Ark., has ordered one 40-ton mogul locomotive from the East St. Louis Locomotive & Machine Shops.

The Wisconsin & Northern, which is under construction, will ask bids for locomotives about April 1. C. H. Hartley is General Manager, Oshkosh, Wis.

The Schneider Granite Company, Middlebrook, Mo., has ordered one 40-ton saddle tank, six-wheel, switching locomotive from the East St. Louis Locomotive & Machine Shops.

The Williamsville, Greenville & St. Louis has ordered one 54-ton, 10-wheel locomotive from the East St. Louis Locomotive & Machine Shops exactly like the one previously ordered and reported in the *Railroad Gazette* of February 8.

The North Shore Railroad, Cuba, will shortly be in the market for six 85-ton freight locomotives. The contract will be placed through the New York offices of the company, 106 Wall street. C. D. Gibbons is President.

The St. Louis & San Francisco is about to order 25 consolidation (2-8-0), 10 ten-wheel passenger (4-6-0), and 10 switching locomotives. The consolidation locomotives will be the same as the last 45 ordered from the Baldwin Locomotive Works, and the ten-wheel and switching locomotives will be the same as they purchased last year.

CAR BUILDING.

Dolese & Shepard, Chicago, are remodeling 150 wooden gondola cars.

The Atlantic Coast Line is in the market for 2,000 additional cars.

The Duluth & Northern Minnesota is in the market for one private car.

The Mexican International will shortly be in the market for coal cars.

The Iroquois Iron Co., South Chicago, Ill., is in the market for four flat cars.

The Eastern Kentucky, it is reported, is figuring on 50 steel underframe gondola cars.

The Tremont & Gulf is asking prices on from 100 to 200 logging cars of 80,000 lbs. capacity.

The Metropolitan West Side Elevated, Chicago, has ordered 20 motor cars from the Pullman Company.

The Camden Interstate Railways, Huntington, W. Va., will shortly be in the market for several electric cars.

The Hecla & Torch Lake is reported to have ordered 150 underframe ore cars from the American Car & Foundry Co.

The Chicago, Milwaukee & St. Paul denies that it will build 3,000 steel cars, as reported in the *Railroad Gazette* of February 22.

The South Manchuria Railway, which is being built by the Japanese Government, will, it is said, order cars in the United States.

The Bolivia Railway is in the market for 10 passenger coaches. The contract will be placed through W. R. Grace & Co., New York.

The Interborough Rapid Transit Co., New York, has ordered 200 cars for its elevated roads and 50 all-steel cars for the subway division.

The South & Western denies having ordered 5,000 hopper bottom coal cars and 25 passenger coaches, as reported in the *Railroad Gazette* of February 22.

The Cleveland, Cincinnati, Chicago & St. Louis, as reported in the *Railroad Gazette* of February 8, is about to order some express cars from Barney & Smith.

The Atlantic Coast Line, as reported in the *Railroad Gazette* of February 15, has ordered 50 flat and 20 express cars from the Hicks Locomotive & Car Works.

The Western Live Stock Express, Chicago, has ordered 100 36-ft. stock cars from the Ryan Car Co. in addition to the 100 reported in the *Railroad Gazette* of February 22.

The Wisconsin & Northern, which is under construction, will ask bids for cars about April 1. C. H. Hartley is General Manager, Oshkosh, Wis.

The Chicago, Burlington & Quincy, as reported in the *Railroad Gazette* of February 1, has ordered 2,000 steel gondola cars of 100,000 lbs. capacity from the Standard Steel Car Co., for September, October and November delivery.

The North Shore Railroad, Cuba, will shortly be in the market for 400 gondola and 50 box cars. The contracts will be placed through the New York offices of the company, 106 Wall street. C. D. Gibbons is President.

The St. Louis & San Francisco has ordered 40 coaches, 15 chair cars, six combination mail, baggage and express cars, all 70 ft. long over end sills, and 25 baggage and express cars 60 ft. long over end sills from the Pullman Co., all for October and November delivery.

The Solvay Process Company, Syracuse, N. Y., has ordered 25 steel tank cars of 80,000 lbs. capacity from the Bettendorf Axle Company for April delivery. These cars will measure 38 ft. long and 9 ft. wide, over all. The special equipment includes:

Bolsters	Bettendorf
Brake-beams	Damascus
Brakes	Westinghouse
Draft rigging	Miner
Dust guards	Harrison
Trucks	Bettendorf

The United Zinc & Chemical Company, Kansas City, Mo., has ordered eight steel tank cars of 80,000 lbs. capacity from the Bettendorf Axle Company for May delivery. These cars will measure 25 ft. 7 in. long, 9 ft. wide and 11 ft. 11⅜ in. high, over all. The special equipment includes:

Bolsters	Bettendorf
Brake-beams	Monarch
Brake-shoes	Walsh
Brakes	Westinghouse
Brasses	Camel
Couplers	Major
Draft rigging	Miner
Dust guards	Harrison
Trucks	Bettendorf

The United Railways & Electric Co., of Baltimore, as reported in the *Railroad Gazette* of February 22, has ordered from the J. G. Brill Co. 40 semi-convertible street cars. These cars will seat 44 persons, and will measure 30 ft. 8 in. long, inside measurement, and 43 ft. 4 in. long and 8 ft. 5 in. wide, over all. Bodies and underframes will be of wood. Each will be equipped with four Westinghouse motors, multiple unit control. The special equipment includes:

Air brakes	Westinghouse
Brakes	Peacock
Trucks	Brill
Tires	Midvale
Wheels	National Car Wheel Co.

The Bolivia Railway, as reported in the *Railroad Gazette* of February 22, has ordered from the Middletown Car Works fifty 30-ton, meter gage, flat cars, and twenty 30-ton, meter gage, stock cars, for June and July delivery. The flat cars will measure 34 ft. 4 in. long and 7 ft. 9 in. wide, inside measurements, 2 ft. 6¾ in. high from top of rail to center of drawbar, and 36 ft. 9 in. long, over all. The stock cars will measure 32 ft. 9 in. long, inside measurement; 2 ft. 6¾ in. high from top of rail to center of drawbar, and 36 ft. 9 in. long, and 8 ft. 8 in. wide, over all. Underframes of all cars will be of steel. The special equipment includes:

Brakes	Westinghouse
Brasses	Brady
Couplers	Janney
Springs	Pittsburg Steel & Spring Co.
Trucks	Diamond Arch bar

The Charleston & Western Carolina, instead of the Atlantic Coast Line, as reported in the *Railroad Gazette* of February 15, has ordered 200 double felt-lined ventilated box cars of 60,000 lbs. capacity from the Western Steel Car & Foundry Company, and 50 flat cars of 60,000 lbs. capacity from the Hicks Locomotive & Car Works. The flat cars will measure 40 ft. 8¾ in. long, 10 ft. wide and 4 ft. 4¼ in. high, over all. The box cars will measure 35 ft. 11 in. long,

8 ft. 6 in. wide and 7 ft. 5⅛ in. high, inside measurements, and 36 ft. 6⅝ in. long, 9 ft. ⅝ in. wide and 12 ft. 9¼ in. high, over all. Bodies and underframes of all cars will be of wood. The special equipment for both includes:

Bolsters	Truck, built-up I-beam and cover plate
Brake-beams	Pennsylvania deck
Brake-shoes	Christie
Brakes	Westinghouse
Couplers	Tower, slotted for Farlow key
Door fastenings	National Mall. Castings Co.
Draft rigging	Farlow twin spring
Dust guards	Harrison
Journal boxes	Symington
Paint	A. C. L. standard
Roofs	Murphy outside
Springs	A. C. L. standard
Trucks	A. C. L. standard

The Great Northern, as reported in the *Railroad Gazette* of February 8, has ordered 30 first class coaches, four dining cars, five second class coaches, ten 14-section tourist sleeping cars, twelve 12-section sleeping cars, three 16-section sleeping cars, 25 baggage cars of 60,000 lbs. capacity, 15 baggage and mail cars and 10 mail cars from Barney & Smith, for July and August delivery. The first class coaches will weigh 111,000 lbs. and measure 80 ft. 11 in. long, 10 ft. 2 in. wide and 14 ft. 1 in. high, over all. The dining cars will weigh 118,000 lbs., and measure 75 ft. 6 in. long, 10 ft. 2 in. wide and 14 ft. 2 in. high, over all. The second class coaches will weigh 93,000 lbs. and the tourist sleeping cars will weigh 90,000 lbs.; both the second class coaches and the tourist sleeping cars will measure 68 ft. 5 in. long, 10 ft. 2 in. wide and 14 ft. 1 in. high, over all. The 12-section sleeping cars will weigh 122,000 lbs., and measure 82 ft. 2 in. long, 10 ft. 2 in. wide and 14 ft. 2½ in. high, over all. The 16-section sleeping cars will weigh 121,000 lbs., and measure 73 ft. 3 in. long, 9 ft. 8 in. wide and 11 ft. 3½ in. high, inside measurements. The baggage cars will weigh 98,000 lbs., and measure 68 ft. 8½ in. long, 10 ft. 2¾ in. wide and 14 ft. 4 in. high, over all. The baggage and mail cars will weigh 106,000 lbs., and measure 69 ft. 9 in. long, 9 ft. 10 in. wide and 11 ft. 2¼ in. high, inside measurements. The mail cars will weigh 99,000 lbs., and measure 60 ft. ⅜ in. long, 9 ft. 10 in. wide and 11 ft. 2½ in. high, inside measurements. The special equipment for all is as follows:

Brake-beams	Diamond special
Brake-shoes	Great Northern
Brasses	Great Northern
Couplers	Tower
Curtain fixtures (for all but baggage and mail cars)	Forsyth
Curtain material (for all but baggage and mail cars)	Pantasote
Door fastenings (for all but baggage, baggage and mail and mail cars)	Dayton
Door fastenings (for baggage cars)	Barney & Smith
Doors	Barney & Smith
Draft rigging	Great Northern
Dust guards	Harrison
Heating system	Gould
Journal boxes	Great Northern
Paint	Flood & Conklin
Roofs (all but baggage, baggage and mail and mail cars)	Empire
Seats (all but baggage, baggage and mail and mail cars)	Barney & Smith
Springs	Simplex
Trucks	Great Northern
Vestibules (all but baggage and mail and mail cars)	Pullman

RAILROAD STRUCTURES.

ALLIANCE, OHIO.—It is understood that the Pennsylvania will soon begin work on a large roundhouse to cost about $80,000.

HARRISBURG, PA.—Applications have been made to the City Council for permission to build the Philadelphia & Reading bridges at Thirteenth street and at Fifteenth street.

HOBOKEN, N. J.—The new terminal station of the Delaware, Lackawanna & Western at this place was opened for traffic February 25.

JERSEY CITY, N. J.—The Pennsylvania, it is reported, has authorized additions and extensions to its passenger terminal here to cost about $300,000, to include a new building 120 x 620 ft. to be built north of the slip now used by the boats to Twenty-third street, New York. Pier D, now occupying the space to be used as a site for the new building, will be rebuilt. At the north end of the present lobby in the passenger station an addition of 60 ft. will be added to connect with the new section. The new portion will include a large immigrants' waiting room, 120 ft. wide and 160 ft. long.

MEXICO CITY, MEX.—The Mexican Central, it is said, will build many new bridges on its main line and branches during 1907.

MONCTON, N. B.—An officer writes that this company will rebuild about six bridges and replace 12 short spans with new structures; also put up a new passenger station at Amherst, N. S., new machine shop at Riviere du Loup, and several smaller buildings.

TALLADEGA, ALA.—The Atlanta, Birmingham & Atlantic will shortly start work on a concrete freight house 50 ft. x 120 ft. on East street.

WILLIAMSPORT, PA.—An ordinance is to be submitted to the City Council authorizing the acceptance of the bid of Rogers Bros., of Albion, Pa., to build a bridge at the Campbell street under grade crossing for $39,900, of which the Pennsylvania Railroad is to pay $18,700, and the city the balance.

WINNIPEG, MAN.—Canadian Pacific improvements include the following: Steel bridge on the line from Lethbridge to Macleod, to cost $1,000,000; new station at Port Arthur, some other buildings at Ignace, Ont., and a new yard at Coalridge, Alb.

RAILROAD CONSTRUCTION.

BOSTON & ALBANY.—This company has promised to Boston merchants who complained of inadequate facilities that $1,000,000 shall be spent in improving the road, largely by putting in additional tracks near Boston and making terminal improvements in that city.

BALTIMORE & OHIO.—A preliminary survey has been made and rights of way secured for a new line from Johnstown, Pa., to Somerset, designed to relieve the congestion of traffic on the Somerset & Cambria branch. It will be almost a direct line south from Johnstown and will traverse the western end of Somerset County. The road will branch from the present Somerset and Cambria line, in Stoney Creek township, at Hogback tunnel, and will run through Johnstown, Boswell, Connors Postoffice and other small points. It will tap the Jerome, Boswell and Quemahoning coal fields, which are now connected with the Somerset & Cambria branch by poorly equipped branch lines with steep grades. The Somerset & Cambria branch is a single-track line and is crowded with freight.

BUFFALO & SUSQUEHANNA.—The company has decided to tunnel the mountain between Corbett, Pa., and Hull and also Newfield mountain, beginning work in March. Each tunnel will be about one mile long. This arrangement will give the company an eastern connection from the Clearfield region by way of the Erie at Hornell, N. Y.

BURR'S FERRY, BROWNDEL & CHESTER.—Contract has been given by this company to the Womack Construction Co. for building its proposed line from 10 miles east of Rockland, Tex., to Browndel, 25 miles.

CANADIAN NORTHERN.—MacKenzie & Mann have petitioned the Government for a guarantee of $20,000 a mile on a proposed line from a point nine miles above Parry Sound, Ont., on the Toronto-Sudbury section of the James Bay Railway, to North Bay, 75 miles. At North Bay the proposed line is to connect with the Temiskaming & Northern Ontario, which is being extended to a connection with the National Transcontinental near Lake Abitibi.

CINCINNATI, BLUFFTON & CHICAGO.—Contracts are reported let by this company for extending its road from Bluffton, Ind., northwest to Huntington, 23 miles; also from Portland south to Union City. The line, in connection with the Dayton & Union forms one side of a triangle controlled by the Erie.

COLUMBIA RIVER, OUTLOOK & NORTHWESTERN.—Application has been made for a charter by William Stewart and M. C. Stewart, with $3,000,000 capital. The company is being organized to build from Spokane, Wash., over the Cascade mountains, through the Yakima Indian Reservation to Vancouver, Wash. The office of the company is at Outlook, Wash.

CULLMAN SOUTHWESTERN.—Work has been started on the first section of this proposed line from Cullman, Ala., to Bremen, 20 miles. The contract for this work, which has been let, amounts to about $600,000.

GRAND TRUNK PACIFIC.—The Dominion Government, according to reports from Ottawa, on February 25 let contracts for building 450 miles on five sections of the National Transcontinental Railroad as follows: From Moncton west 60 miles to a point near Chipman; Grand Falls, N. B., west to the Quebec boundary, about 62 miles; from the Quebec bridge east about 150 miles; from La Tuque, Que., west to Weymontachene, about 45 miles; from a point eight miles west of the Abitibi river, easterly about 150 miles. The amount of the five bids was about $13,000,000, equal to about $30,000 a mile. Three of the sections are to be built by the Grand Trunk Pacific, one by M. T. & J. T. Davis, of Ottawa, and the remaining section by Lyons & White, of Ottawa.

INDIANAPOLIS, HUNTINGTON, COLUMBIA & NORTH-WESTERN.—An officer writes that this company, which proposes to eventually use electricity, but for the present will use steam as a motive power, commenced grading in September, 1906, from Indianapolis, Ind., via Huntington and Wawasee Lake to Goshen, 155 miles. Contracts let to M. V. Ryan, of Syracuse, Ind., for building from Huntington to Goshen, 60 miles. Grading completed from Wawasee Lake to Benton, 11 miles, and tracklaying is to be started early in March. Denver L. Horner, of Syracuse, Ind., Chief Engineer.

LOUISVILLE & NASHVILLE.—Under the name of the Pine Mountain, this company is reported building a line between Pineville and Williamsburg, Ky., 35 miles, to new coal fields.

MEXICAN CENTRAL.—On the Tuxpan extension of this road, according to Lewis Kingman, Chief Engineer, who has recently in-

spected the work, there are 4,000 men at work building the line, and it is expected to have the work completed by the first of next year. Some heavy work remains to be done between Colima and the Port of Manzanillo. The old narrow gage road, which was bought by the Mexican Central, will be rebuilt and used as part of the through line. Two tunnels are now being driven through mountains between these two points.

MEXICAN ROADS.—Walter C. Palmer, Zacatecas, Mex., who was recently granted a concession by the Mexican Government for a line from Gutierrez, state of Sonora, on the Mexican Central, to Durango, where a connection is to be made with the Mexican International, is now in the United States making arrangements to begin work on the line. It is reported that the American Smelting & Refining Co., which owns extensive mining properties at Sombrete, which will be reached by the new line, is back of the project.

NORTH SHORE.—Incorporation has been granted this company under the Cuban laws, with a capital of $2,500,000. The company, which is backed by New York capitalists, with C. D. Gibbons, 106 Wall street, as President, is said to have made financial arrangements with a French syndicate, and construction work will be started soon. The company proposes to build from a point on Mayanabo Bay, north of Nuevitas, in the Province of Puerto Principe, west through Cubitas Valley to Caibarien, a port in the Province of Santa Clara, about 250 miles. A 50-mile branch is to be built from Senada to iron mines south of the Cubitas mountains.

OCEAN SHORE.—An officer writes that this company, which will use electric power for its passenger service and steam for its freight, has been under construction for the past year, from San Francisco, Cal., south to Santa Cruz, 83 miles. Contracts for building the line, which is to be double-track, have been let to the Rialto Construction Co. from San Francisco to Ocean View, eight miles; to Willitt & Burr, the Ransome Construction Co. and Mahoney Bros. from Ocean View to Mussel Rock, 4¾ miles; to the Ransome Construction Co., Lewis Moring and Antonelli & Bandman from Mussel Rock to San Pedro Mountain, eight miles; to the Ransome Construction Co. from San Pedro Mountain to Wadse Beach, 41 miles, and to Shattuck & Desmond and Pratchner & Chadwick from Wadse Beach to Santa Cruz, 21 miles. Grading is about completed on the entire line, and track is laid for 10 miles between San Francisco and Mussel Rock; also for 12 miles from Santa Cruz to Davenport. Franchises and land has been secured for terminals at both San Francisco and Santa Cruz. J. Downey Harvey, President; Burke Corbet, Secretary and Treasurer, and J. B. Rogers, Chief Engineer, San Francisco.

OREGON EASTERN.—See Southern Pacific.

PHILADELPHIA, NORRISTOWN & NORTHERN.—Incorporated, with a capital of $85,000, in Pennsylvania, to build from Villa Nova, Pa., to Norristown, 8½ miles, with a branch from West Conococheague. Morris Bernheimer is President. G. B. Staples, E. H. Weeks, I. Pratt, C. H. Richardson, S. E. Staples and W. S. Huntington, all of Philadelphia, are directors.

PUYALLUP VALLEY NORTHERN RAPID TRANSIT.—Contracts are reported let to the Engineering Construction Company, of New York, to build this proposed line. The project is said to be allied with the Puget Sound, Chelan & Spokane.

ST. JOSEPH VALLEY TRACTION.—This company has given a mortgage to secure funds to extend its road from Middlebury, Ind., west to Elkhart or Goshen.

SEBASTICOOK & MOOSEHEAD.—A bill has been introduced in the Maine Legislature to authorize this company to extend its lines to connect with the Canadian Pacific and the Wiscassett, Waterville & Farmington. If the proposed extensions are built they will make a connection from the Canadian Pacific to tidewater at Wiscassett. The Canadian Pacific at present has an outlet on the Maine sea coast. The proposed extension aggregates about 72 miles of track.

SOUTHERN PACIFIC.—According to reports from Portland, Ore., final location for the Oregon Eastern from Natron, Ore., southeast to Ontario, 240 miles, has been made, and it is expected that construction work will be started early this summer.

SPOKANE & INLAND EMPIRE.—Surveys are being made for piercing a tunnel in the business district of Spokane to connect this company's freight stations. The tunnel is to be three-fourths of a mile long and will cost about $1,000,000.

SPOKANE FALLS & NORTHERN.—This company, it is said, has located the route for a new cut-off to leave the main line at Denton's spur and rejoin it near Chewelah, 22 miles. Work is to be started this month.

TEXAS ROADS (ELECTRIC).—Recent favorable legislation will permit the Stone & Webster Syndicate to at once build its proposed electric line between Houston and Galveston, about 51 miles. The company proposes to build branches to points on Galveston Bay.

TONOPAH & GREENWATER.—Incorporated in California with $500,000 capital by F. M. Smith, of Oakland, Cal.; C. B. Zabriskie, of New York; De Witt Van Buskirk, of Bayonne, N. J., and others, to build a line from Amargosa Borax Works in Inyo County, Cal., to Greenwater.

RAILROAD CORPORATION NEWS.

ATCHISON, TOPEKA & SANTA FE.—Gross earnings for January, 1907, were $7,695,254, an increase of $930,287; net earnings $2,489,502, an increase of $93,508.

BALTIMORE & OHIO.—Gross earnings of this system, including the Baltimore & Ohio Southwestern, for January, 1907, were $6,365,559, a decrease of $207,907; net earnings $2,000,434, a decrease of $447,473.

CHICAGO & ALTON.—See Peoria Terminal Railway.

CHICAGO, CINCINNATI & LOUISVILLE.—It is announced that the $4,602,000 capital stock of this company will be returned to W. A. Bradford, President of the road, and associates, who owned the road prior to July, 1904, when all the capital stock was sold to the Pere Marquette for $3,500,000 Pere Marquette 4 per cent. 10-year collateral trust bonds; these bonds are now to be returned. The terms of the agreement, it is said, also include the turning over to Mr. Bradford and associates $400,000 receiver's certificates of the C., H. & D. and the Pere Marquette; the ratification of the agreement for the entrance of the C., C. & L. into Chicago over the Illinois Central tracks; a second entrance for the C., C. & L. into Cincinnati over the C., H. & D. tracks; and the waiving by the C., H. & D. of all claims to expenditures amounting to about $1,500,000, which the last named company made in improving the C., C. & L. when the C., H. & D. was in control through its ownership of the Pere Marquette.

CHICAGO, ROCK ISLAND & PACIFIC.—See Peoria Terminal Railway.

CHICAGO TERMINAL TRANSFER.—A decree of foreclosure has been granted against this company under a judgment for $16,824,690. The company has been in the hands of a receiver since April, 1906, and the property, consisting of a belt line around Chicago, several branch lines and the Grand Central Station, which is used by the Baltimore & Ohio, the Chicago Great Western, the Chicago Junction and the Pere Marquette, is to be sold, on a date to be fixed later, for a sum not less than $15,140,000, which is the amount of first mortgage, 4 per cent. bonds of 1947 outstanding.

CINCINNATI, HAMILTON & DAYTON.—See Chicago, Cincinnati & Louisville.

COLORADO & SOUTHERN.—This company has sold to the Guarantee Trust Co. and to Hallgarten & Co. $1,026,000 five per cent. 10-year equipment trust bonds, dated April 1, 1907. One subsidiary, the Fort Worth & Denver City, has sold $376,000 bonds, and another, the Trinity & Brazos Valley, has sold $500,000 bonds, the last named securities being guaranteed principal and interest by the Colorado & Southern and the Rock Island Company, which jointly control the road. The proceeds of these three issues are to pay in part for equipment costing $2,250,000 and consisting of 54 locomotives, 1,085 freight cars and 14 cabooses.

HOCKING VALLEY.—See Kanawha & Michigan.

ILLINOIS CENTRAL.—See Chicago, Cincinnati & Louisville.

KANAWHA & MICHIGAN.—The committee recently appointed to formulate a plan for refunding present indebtedness and beginning dividend payments has agreed on a plan, which will be submitted to the Directors at their next meeting, probably early in March. The plan will be operative only in case the proposed consolidation with the Hocking Valley does not go through. This merger is now being held up by the Attorney-General of Ohio on the ground that the roads are parallel and competing. (Jan. 11, p. 62.)

KANSAS CITY SOUTHERN.—Gross earnings for January, 1907, were $783,456, an increase of $118,501; net earnings $335,761, an increase of $165,309.

PEORIA & PEKIN TERMINAL.—See Peoria Terminal Railway.

PEORIA TERMINAL RAILWAY.—The property of the Peoria & Pekin Terminal has been sold under foreclosure for $600,000 to the Peoria Terminal Railway, which was recently organized as the successor. The Chicago & Alton and the Chicago, Rock Island & Pacific, which jointly own the $1,000,000 capital stock of the new company, have agreed on a plan of reorganization providing for the refunding of the $697,000 P. & P. T. first mortgage 5 per cent. bonds by an issue of Peoria Terminal 4 per cent. first mortgage bonds guaranteed by the two controlling companies, and for the refunding of the $280,000 refunding mortgage 5 per cent. bonds with new income bonds. The P. & P. T. operated 29 miles of road by steam and electricity between Peoria and Pekin, Ill., and went into the hands of a receiver in November, 1906.

PERE MARQUETTE.—See Chicago, Cincinnati & Louisville.